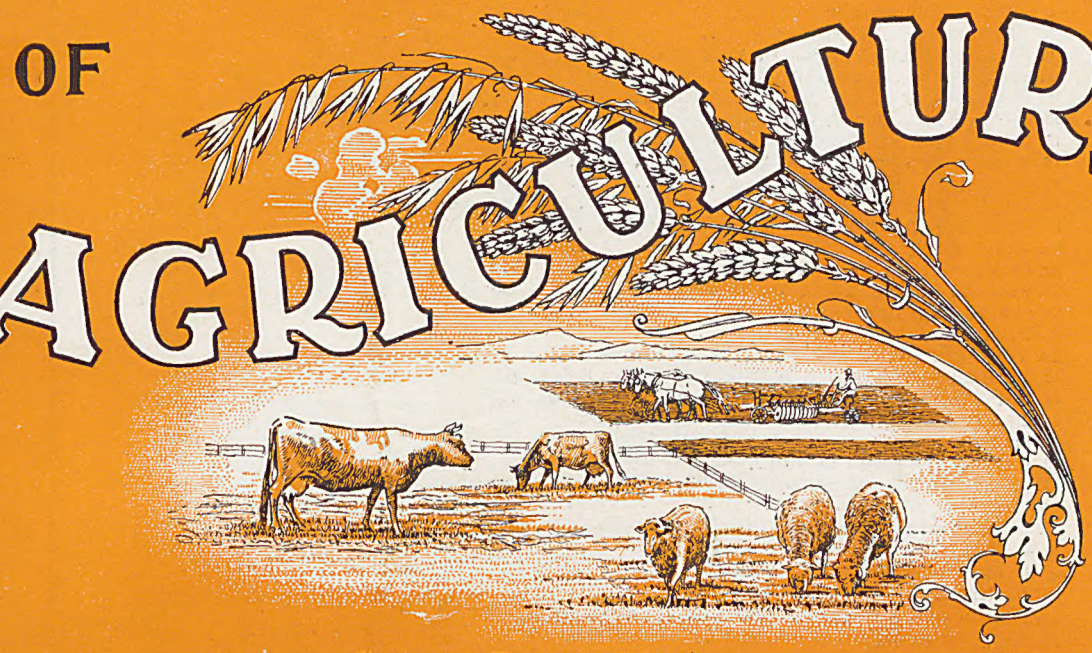
VOL. XXIX. [Registered at the General Post Office, Melbourne, for transmission by Post as a Newspaper.] PART 5.

# THE JOURNAL OF THE DEPARTMENT OF AGRICULTURE OF VICTORIA, AUSTRALIA.



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*Issued under the direction of the Hon. W. Slater, M.L.A., Minister of Agriculture.*


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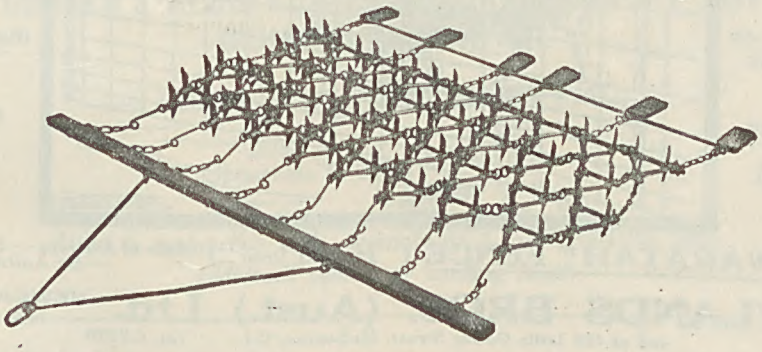

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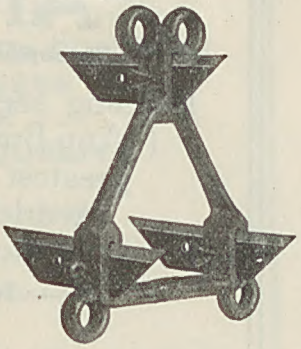

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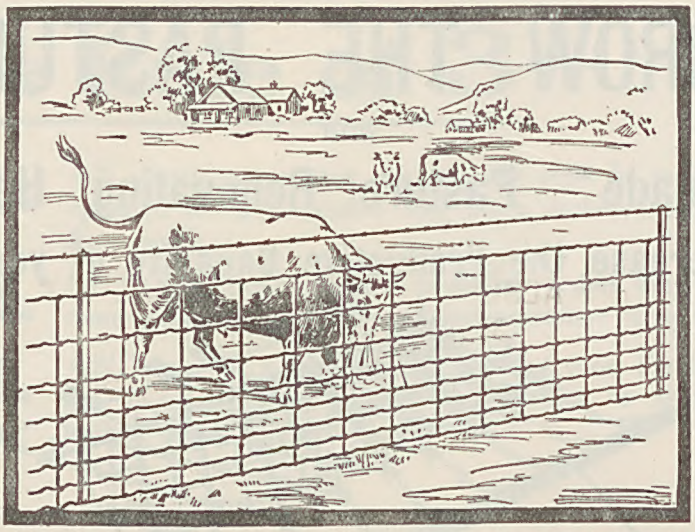

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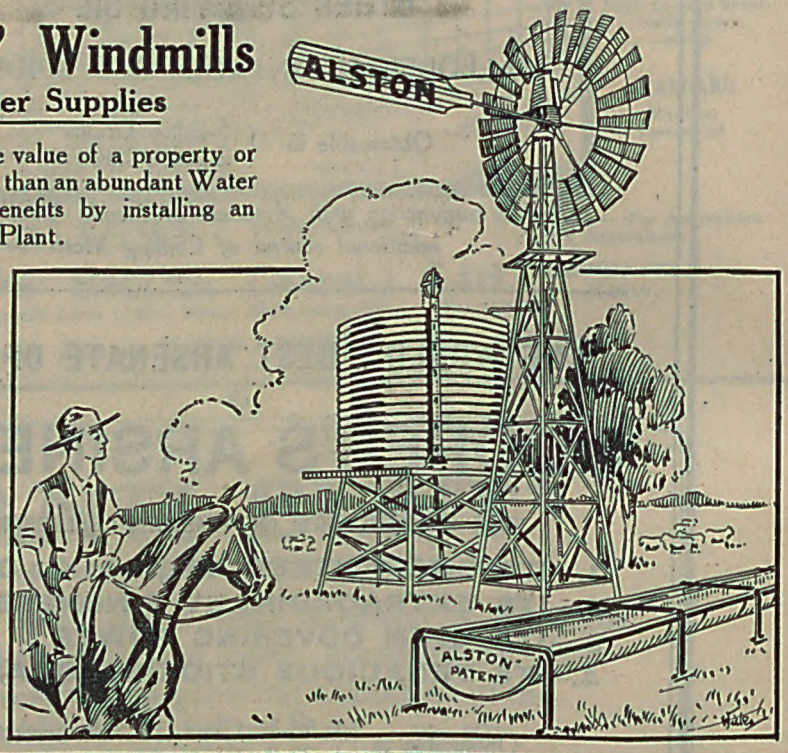


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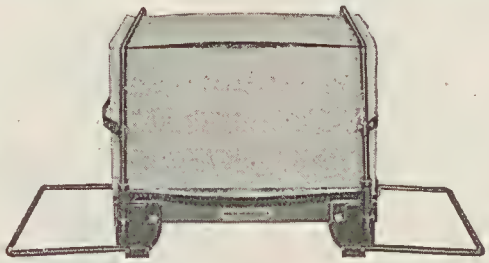

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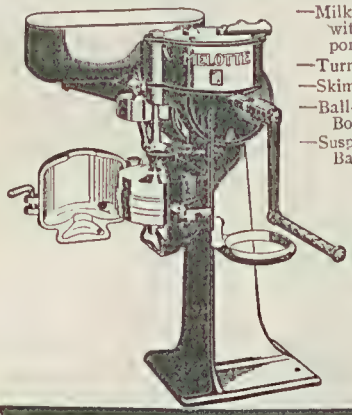


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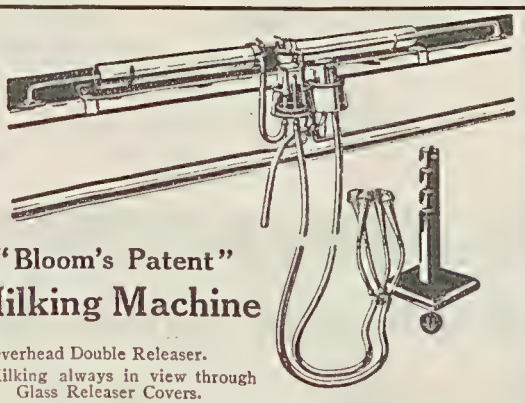

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

# Grade Herd Testing

## Ten Years of Progress

*An account of the establishment and subsequent progress of the grade herd testing movement in Victoria.*

IN the Old World dairying countries the practice of weighing and recording milk has existed for a great many years. Records exist of Ayrshire cows producing over 30 lb. of milk at one milking, and over 70 lb. a day (this under official test, at the Ayr Show, for 48 hours) as far back as 1861. In Denmark there are now in the neighbourhood of 1,200 herd testing associations, testing approximately 500,000 cows.

As at Vegen, in Denmark, in 1895, so at Yinnar, Victoria, in 1921, the Herd Test Association work had a small beginning, but in the last ten years a very great increase has taken place in the number of associations formed in this State. From the small beginning of two associations in 1921, the movement has grown to 140 units now at work, with several more being organized.

The system in use is the Danish-Scotch type, with local application, and it has proved to be sound, practicable, and workable.

### *Early Victorian Work.*

For several decades, it has been the policy of the officers of the dairy division to recommend and to demonstrate the valuable work of systematic milk recording and testing of grade herds, and in 1898 a bulletin was published outlining the advantages of testing the herd, explaining the methods that should be adopted, and drawing the attention of dairy farmers to the fact that weekly and monthly milk charts for recording the daily weights of milk could be obtained on application to the Department. However, nothing of a concrete nature was attempted until 1913, when an effort was made by the Bloomfield Co-operative Butter and Cheese Company to organize an association. This proved an abortive effort, and it was not until July of 1914 that definite steps were taken to organize a test association. This was at Colac, after the dairy company had Mr. Byrne, of Paeroa, New Zealand, lecturing and canvassing for several days.

Subsequently, at the request of the Colac association, this Department decided to bear the expense of printing all stationery, forms, &c., required for this herd-testing movement in Victoria, and to reimburse the associations any expenditure incurred in carrying milk samples on the railway. Unfortunately, this system did not survive long, and it is noteworthy that it has failed in the several places where it was introduced, viz., at Foster, Leongatha, Hill End, Ballendella, and other areas. Even in New Zealand there has been a decided swing-over to the group or association system now general throughout this State.

During the early years of the standard pure-bred herd test, officers of the Dairy branch endeavoured to encourage the testing of grade herds wherever possible. Small

*Delegates to First Grade Herd-testing Conference in Victoria—held at Stony Creek in 1922.*

testing outfits were carried by officers doing field work, and the methods of making the test were explained to dairy farmers. In addition, milk testing with the Babcock outfit was taught by departmental officers in a few schools in dairying districts.

During 1918-20 Mr. W. J. Yuill, Dairy Supervisor, was associated with several keen dairy farmers at Yinnar, who were keen to organize a herd-testing association, but found great difficulty in getting other men to think likewise, mainly owing to lack of knowledge regarding the cost of the work. A meeting was called at Yinnar, but it was found that insufficient support was forthcoming to justify making a start. The meeting decided, however, to ask the department to allow Mr. Yuill to canvass the outlying area and interview several likely members. The result was that sufficient men were found to make a start. Later in the same year a second association was formed at Tarwin Lower.

### *Government Subsidy.*

Towards the end of 1919 it was recommended by the Chief Veterinary Officer that a subsidy should be offered to all associations conducting a nine months' test and forwarding returns to the Department, such subsidy not to exceed 1s. per cow tested. At that time no action was taken.

In June, 1924, however, Cabinet decided to make available a sum of £5,000 to subsidize grade herd testing. The terms and conditions of the subsidy were as follow:—

1. That every member undertakes to effect and does effect the culling from the herd of all cows which, having reached the age of six years, have failed in two consecutive lactation periods to produce 175 lb. of butter-fat.

2. That the association undertakes that within fifteen months of the establishment of the association 20 per cent. of the bulls being used for service in the herds of members shall be ex dams which, under Government test, have reached the standard prescribed by the regulations governing the testing of pedigree herds, and that the percentage of such record-bred bulls used by members shall increase at the rate of 20 per cent. per annum thereafter.

### *Central Organization.*

In the meantime, during 1922, three other associations were formed at Mirboo, Stony Creek, and Toora. At this time there existed some differences of working methods which were considered to be detrimental to the progress of the movement. A conference of the five associations was arranged, therefore, to determine the best methods, &c. This was held at Stony Creek. At this conference Mr. Yuill, of the Department of Agriculture, was appointed secretary and organizer of the whole movement, which was then organized into a body known as the Gippsland United Cow Testing Association. During 1923, associations were formed at Narracan shire, Yarram, and Boolarra. In 1924 the "Better Farming Train" was introduced, and, following its first visits, several new associations were inaugurated, viz., Maffra, Poowong, Archie's Creek, Kongwak, Milawa, Myrtleford, Corryong, Kiewa, Eskdale, Tallangatta, Kerang, and other areas.

In September, 1925, a conference was called, and all associations in Victoria were invited to send delegates. As the movement had then grown out of Gippsland, the name of the existing organization was altered to the Victorian United Cow Testing Association. This is now a duly constituted body, operating through its council, or central body, which

*One of the First Grade Herds Tested in Victoria—Mr. T. Collins's Herd at Yinnar. Five years' average, 386 lb. butter-fat.*

meets four times a year. This council is elected annually at a conference of delegates, representing the associations from all over Victoria. The State is divided into five areas, and each area elects its own two delegates to the council for the ensuing year.

### *Work Accomplished.*

It is claimed for the Victorian system that it is operating on sound lines. Efficiency of any movement or industry must be the determining factor of its usefulness, and the industry should learn to stand on its own feet; thus the responsibility of carrying on the work of the movement has been placed on the council of the Victorian United Cow Testing Association. This creates a State-wide interest, and farmers are shown that it is best to control their own interests and industry.

Valuable work is being effectively done in a quiet way. Some thousands of cull cows have been spayed and taken out of the industry. A marked impetus has been given to breeding better dairy cows; keen interest has been developed in learning to feed dairy cows as they should be fed, and top-dressing and reconstruction of pasture and conservation of fodder are now extensively practised.

Much has been said regarding the perpetuation of the "culled" cow, of her being tested in one herd, repurchased, and going through the process in yet another herd. The Department has records of several thousands of cows that have been spayed, while large numbers are fattened for market when found to be inefficient as dairy cows. At the same time it is not denied that some are sold again as dairy cows and that some traffic exists.

### *Branding.*

From the time of the Stony Creek conference in 1922 and on to last year, serious attention has been directed towards a solution of the disposal of cows proved worthless as dairy animals. In this State there are a number of dairy herds that are over 100 head in size, some in the vicinity of 200 cows, and quite a large number of from 50 to 100 cows. Many such herds are worked on the share principle, and neither the owner nor the share-farmer can individualize the herd cows. Names proved useless under such conditions, so also did conformation and marking, &c., and, as in all other countries, it has been found that a system of identification was needed.

After five years of discussion, experience, and investigation, it was decided ultimately to adopt the system designed by an officer of the

Department. Briefly, this consists of a letter or conjoined letter to signify the association, a running number for the member of the association, and a running number for the herd cows. A number, once issued, is never re-allotted.

Example— $\frac{A : 8}{19}$

This brand would indicate No. 19 cow in No. 8 herd in A association.

The scheme is sufficiently elastic to cover all cows in Victoria. This brand will appear on the right neck of every cow that passes through a subsidized herd-testing association, and any cow that appears in a sale-yard carrying this cluster of figures tells her own story. There are many "discarded" or surplus cows in the high quality herds that are being sold on their production card; therefore, the branding system can be used to denote a "cull" in the absence of the association card, or it may be used to reflect a good, honest cow that is not up to the high standard of some herds. For instance, the owner of a 300-lb. herd would cull out cows giving under 250 lb. of butter-fat. Again, where heifers are being retained to build up the herd, many fine old cows are "passed" because of the younger selected cows being still better.

### *Calf-marking Scheme.*

Quite a number of men have been marking their selected calves for many years past. The cry so often heard that owners of small farms cannot afford to rear their own stock, and the need for better dairy cows, have made it appear that some scheme was urgently needed for selecting the best calves and marking them in a definite manner, as a guarantee that they are the calves represented. To this end a scheme has been drawn up for the Victorian United Cow Testing Association, details of which are given hereunder. The branding scheme already mentioned has made it possible to connect the dam and her calf, though there be thousands of such.

The calf-marking scheme has as its objective the selection of female calves from the best producing grade cows. These calves must be sired by a pure-bred bull, that has in turn been bred from a certificated cow in the Government pure-bred standard herd test. The marked calves, therefore, will carry a guarantee that they have 50 per cent. of pure breeding with standard production, and, further, that the producing ability of the 50 per cent. grade dam is definitely known.

Illustrations of the fire-branded association cow that has reached her standard of production—and her tattooed calf as it appears in the calf-marking scheme—are shown herewith, All herd-tested cows are fire-branded on the right neck.

This brand would indicate No. 99 cow in No. 8 herd of X association.

A calf bearing these tattoo marks would be definitely associated with the cow fire-branded as above. The H in a diamond will be the registered mark of the scheme, and the accompanying letter will indicate the year of birth. Therefore, the tattoo will represent a "production pedigree," and also show the age, for with each successive year the next letter of the alphabet is to be used; so that should the scheme continue for 26 years the letter would be Z for that year.

*Grade Friesians that have done well under test—Mr. D. N. Wilcox's Herd at Harston.*

The standards of production in Victoria are for a 273-days period, as in the standard herd test, and for the same reasons. New Zealand has a 305-days period, which makes for higher figures, particularly in the good dairying areas, with high rainfall, and, more particularly, a well-distributed one throughout the summer and autumn. The standards for both countries are as follow:—

New Zealand (305 days).—Mature, 300 lb. butter-fat; 3 years old, 275 lb. butter-fat; 2 years old, 250 lb. butter-fat.

Victoria (273 days).—Mature, 275 lb. butter-fat; 3 years old, 250 lb. butter-fat; senior 2 years, 225 lb. butter-fat.

In October, 1926, the Commonwealth Government decided to contribute towards the cost of grade herd testing on the basis that each unit was to receive from the Commonwealth, through the State Government, 3s. 6d. per cow for the first 400 cows in the unit, and 1s. for each cow in excess of 400, up to and including 1,000 cows. A condition of the grant was that each State Government should contribute a sum not less than the amount paid by the Commonwealth.

The State and Federal subsidies paid to herd-testing associations under these conditions are shown in the following table:—

| Year. | State Government Subsidy. | Federal Government Subsidy. | Total. |
|---|---|---|---|
| | £ | £ | £ |
| 1925–26 .. .. | 1,069 | .. | 1,069 |
| 1926–27 .. .. | 4,887 | 4,102 | 8,989 |
| 1927–28 .. .. | 5,537 | 5,600 | 11,137 |
| 1928–29 .. .. | 8,174 | 8,174 | 16,348 |
| 1929–30 .. .. | 10,620 | 10,620 | 21,240 |
| 1930–31 .. .. | 11,100* | 8,500* | 19,600* |

* Approx.

## *Progress Made.*

The following figures give some indication of the progress that has been made in the ten years of grade herd-testing in Victoria:—

Table showing Increase in Herd-testing Association Work.

| Year. | Units. | Herds. | Cows. |
|---|---|---|---|
| 1921–22 .. .. | 2 | 50* | 1,600* |
| 1922–23 .. .. | 2 | 50* | 1,600* |
| 1923–24 .. .. | 5 | 120* | 4,000* |
| 1924–25 .. .. | 14 | 336* | 11,200* |
| 1925–26 .. .. | 36 | 864* | 25,632* |
| 1926–27 .. .. | 61 | 1,464 | 43,432 |
| 1927–28 .. .. | 73 | 1,775 | 51,976 |
| 1928–29 .. .. | 105 | 2,520 | 74,760 |
| 1929–30 .. .. | 134 | 3,133 | 95,408 |

* Estimated.

An example of the progress inevitably associated with herd testing is furnished by the records of the Condah Swamp Association since its inception in 1925. These show that over a period of five years the average butter-fat yield has been increased from 134 lb. to 241 lb., an increase of 107 lb.

Condah Swamp and District Herd Testing Association.

| Year. | No. of Members. | No of Cows. | Milk. | Average Test. | Butter-fat. |
|---|---|---|---|---|---|
| | | | lb. | % | lb. |
| 1925–26 | 22 | 647 | 3,419·7 | 3·92 | 134·2 |
| 1926–27 | 26 | 697 | 4,284·8 | 4·23 | 179·9 |
| 1927–28 | 24 | 604 | 4,884·5 | 4·20 | 205·1 |
| 1928–29 | 26 | 643 | 5,206·2 | 4·23 | 219·1 |
| 1929–30 | 26 | 657 | 5,635·6 | 4·22 | 241·3 |

*The first grade cow in Victoria to yield more than 500 lb. butter-fat under Herd Recording Test—Mr. J. Nuttall's Grade Jersey. Many grades have since exceeded this figure.*

This association provides also a striking instance of the development in an individual herd, that of Mr. D. N. Cannon. In 1925-26, the nineteen cows in this herd averaged 141 lb. butter-fat. By 1928-29 the average yield for ten cows had been increased to 284 lb. These ten cows thus return more butter-fat than did the original nineteen. Last year, twelve cows in the herd gave an average yield of 346 lb. butter-fat.

Results for 1929-30 are not yet complete, but the following tables show in detail the records of 103 units, comprising 67,431 cows:—

| Area. | Units. | Herds. | Cows. | Average Butter-fat. | Percentage of Cows under 4 years. | No. of Pure-bred Bulls. |
|---|---|---|---|---|---|---|
| | | | | lb. | | |
| Western .. | 30 | 635 | 21,940 | 215·7 | 31·1 | 444 |
| North-East | 12 | 170 | 5,145 | 191·4 | 32·4 | 116 |
| Gippsland | 43 | 1,058 | 30,506 | 242·8 | 39·1 | 661 |
| Goulburn Valley .. | 18 | 493 | 10,841 | 235·4 | 46·2 | 386 |
| Totals .. | 103 | 2,356 | 67,431 | 232·8 | 37·7 | 1,607 |

In the table below are shown the numbers of herds and cows which, in the year under review, yielded stated quantities of butter-fat.

| Name of Association. | Herds. | | | | | | | | Cows. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Over 400 lb. Butter-fat. | 350 to 400 lb. Butter-fat. | 300 to 350 lb. Butter-fat. | 250 to 300 lb. Butter-fat. | 200 to 250 lb. Butter-fat. | 150 to 200 lb. Butter-fat. | 100 to 150 lb. Butter-fat. | Under 100 lb. Butter-fat. | Over 700 lb. Butter-fat. | 600 to 700 lb. Butter-fat. | 500 to 600 lb. Butter-fat. | 400 to 500 lb. Butter-fat. | 300 to 400 lb. Butter-fat. |
| Goulburn Valley .. | 5 | 20 | 50 | 79 | 163 | 170 | 41 | 5 | .. | 2 | 28 | 263 | 555 |
| Gippsland .. | 3 | 24 | 105 | 268 | 221 | 209 | 23 | 2 | 2 | 6 | 53 | 509 | 3,727 |
| Western .. .. | .. | 6 | 26 | 124 | 344 | 294 | 31 | 2 | .. | 1 | 17 | 146 | 2,351 |
| North East .. | .. | 2 | 8 | 23 | 63 | 114 | 41 | 8 | .. | .. | .. | 50 | 505 |
| Totals .. | 8 | 52 | 189 | 494 | 791 | 787 | 136 | 17 | 2 | 9 | 98 | 968 | 7,138 |

*The Herd Tester on his Rounds.*

# Pruning Apple Trees

*By J. M. Ward, Superintendent of Horticulture.*

THE principles and details of pruning apple trees have been described so many times by various writers that little or nothing remains to be said. However, there are always new growers inquiring for information, and this short article is written with a view to giving such people, and old growers as well, a few reminders in regard to the handling of full-bearing trees. Consequently, it is not proposed to go into many details.

The average commercial fruit-grower is fairly well acquainted with the various pruning methods. In visiting orchards in all parts of the country, one sees many variations in pruning, and frequently meets orchardists who adopt the same pruning methods year after year without taking into consideration the vagaries of seasonal conditions.

All experienced growers are aware there is no rule of thumb method of pruning fruit trees. The same principles apply the world over, but it is necessary to vary the system according to conditions. Conditions that need to be considered in this respect are climate, soil, variety and type of tree.

In the past, writers on pruning have laid it down that an apple tree should be so shaped, or trained, that when it becomes a mature tree, it should be vase-shaped, that is, have an open centre with the main arms opening out from the trunk in a semi-horizontal fashion. The writer also has been an advocate of training an apple tree along such lines, and in doing so has had cold climates in mind. But apple growing has spread to warmer climates, such as the irrigation districts of northern Victoria and along the Murrumbidgee, where excellent quality apples of certain varieties, such as Granny Smith, Cleopatra, and Dunn's are produced. Here the summer sun is something to be reckoned with.

Under the conditions that prevail in these northern areas, it is necessary to allow growth in the centre of the tree so as to provide shade and prevent sun-scorch, instead of opening the tree in the centre to allow the sun in. The northern grower, therefore, should not follow too closely the system laid down by the writer and others, who, in advocating the open centre, have had the colder southern districts in mind.

**Fig. 1.—A 4-year-old Jonathan Apple after pruning, with provision made for a solid framework.**

When pruning, it is essential that consideration be given not only to the type of soil, climate, and variety of tree, but also to the type of tree itself. In a block of any variety of apple are to be seen various types of growth —the strong upright grower, the spreading type, and the tree making weak growth. It is not in the best interests of the grower that all these trees should be pruned alike. The strong-growing tree should be fairly lightly pruned, leaving a considerable number of laterals uncut, while the spreading type of tree usually requires harder pruning, the precaution being taken to cut the leaders, where necessary, to a bud pointing to a vertical rather than a horizontal position.

**Fig. 2.—A badly-trained tree, unlikely to produce profitable crops. More leaders should have been provided for when the tree was young.**

It is taken for granted that the pruner has provided a good foundation in the young tree so as to have a solid framework for the future. In doing this, he should have left as many limbs for main arms as is possible for the tree to carry. There is no maximum number of main arms, but there should be a minimum of twelve. (See Fig. 1.)

If a tree is to yield heavy crops, it must have plenty of strong limbs well furnished with fruiting wood. Otherwise its carrying capacity is limited. Many inexperienced pruners fail, in framing a young tree, by making provision for only six to eight main arms. In doing this they give a special invitation to the tree to produce small annual crops. (See Figure 2.)

The grower who has allowed himself to get into a pruning groove should take stock of the situation, and consider whether it would not pay him to adjust his pruning methods. To some extent the pruner can be of considerable help in preventing the trees from becoming biennial croppers.

Some varieties of apples are naturally inclined to bear their fruit on short fruit spurs along the main arms. (See Figs. 3, 4, 5, and 6.)

Among these are Yates, London Pippin, Sturmer, Statesman, and similar growing types. By judicious pruning, most varieties can be induced to become spur bearers, and this is practised by many apple growers, though probably more so in the past than is the case at present. The writer has been an advocate of this system in past years, but realizes that changed economic conditions, together with plantings in irrigated areas, have been responsible for a different line of thought and practice. In short, intense spur pruning is too slow and costly when compared with the results obtained by inducing lateral fruiting. The work of pruning a tree on the lateral system is much quicker and equally, or probably more, effective so far as yields are concerned.

**Fig. 3.—Portion of main arm of spur-bearing tree carrying too many fruit spurs.**

Fig. 3 shows portion of a main arm of a spur-bearing tree, carrying far too many fruit spurs—approximately 200 blossom buds. This branch was taken from a tree carrying about twenty main arms, each of which was covered with fruit spurs, resulting in an over-supply of of blossoms and a poor setting. The excess number of fruiting spurs was due to neglect by the pruner. In Fig. 4 is shown the same branch after pruning. About three-quarters of the spurs were cut out, leaving between 50 and 60 fruit buds. As the result of such pruning the tree sent forth a good growth of laterals, and excellent settings of fruit took place.

**Fig. 4.—Same branch as in Fig. 3 after pruning.**

Fig. 5 shows fruit-bearing spurs, each con-

Fig. 5.—Fruit-bearing spurs.

taining numerous blossom buds. This is the class of wood that requires judicious thinning out during winter months to promote lateral growth.

After a fairly wide experience of apple culture in most of the fruit-growing districts of the Commonwealth and the western States of America and Canada, I would urge growers to leave more fruit-bearing laterals in apple trees than has been the practice in the past.

Of course, one cannot make a drastic alteration in his pruning system. A gradual change over, however, can be made with beneficial results to the grower. An alteration of pruning practices is necessary in orchards that have got into the habit of biennial bearing, which has been more pronounced during the past five or six years than hitherto. As previously stated, however, pruning alone will not adjust this trouble.

Last season, crops varied considerably. Some orchards yielded heavily, others gave fair returns, whilst some had very light crops. As climatic conditions have been favorable for growth, we can anticipate a heavy crop for Victoria during the 1932 season. The apple-grower, therefore, must have both the 1932 and 1933 seasons in mind when he prunes this winter. Those whose trees carried a heavy crop last season should thin out a considerable number of old fruit spurs that do not contain robust fruit buds. (Figs. 3 and 4.) As a result of this, new growth will follow, and will become the future fruit-bearing wood. If this new growth is treated in an intelligent manner, good average crops of fruit should ensue, provided, of course, climatic conditions are satisfactory.

During the process of removing some of the old fruit spurs, the intelligent orchardist will leave a fairly large quantity of one-year-old laterals uncut. These are left with a view to the terminal bud fruiting, and, in some varieties—Jonathan, for example—other buds as well. It should be remembered that the trees which yielded a heavy crop on the fruit spurs last season in many instances did not develop the usual robust fruit buds on the old spurs; therefore they cannot be expected to set an-

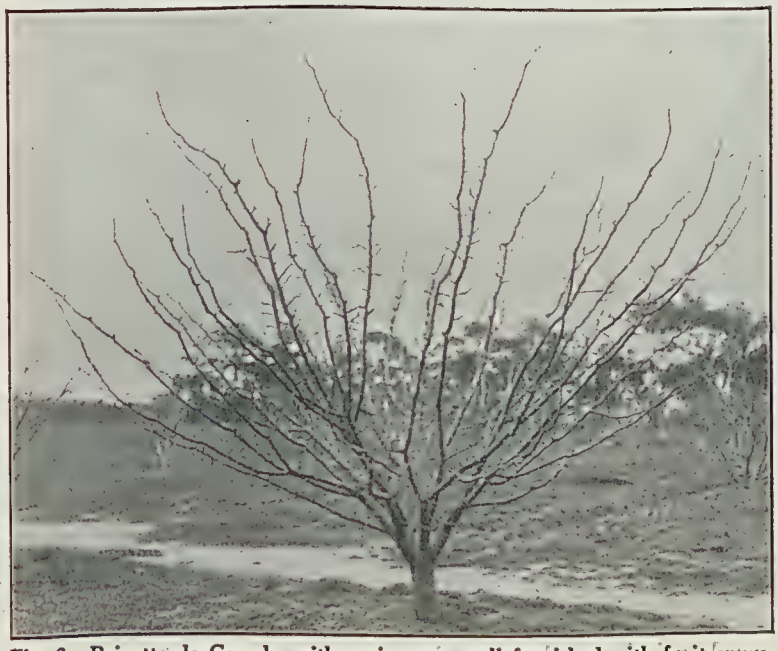


Fig. 6.—Reinette de Canada, with main arms well furnished with fruit spurs.

other heavy crop. The terminal bud on many of the healthy lateral growths will be found to have developed nice robust buds, and these are the buds which should be called upon to furnish fruit next season. There are, of course, a considerable number of other fruit buds that can be depended upon to yield fruit in addition to the terminal buds on the lateral.

Most of the strong-growing laterals can be removed entirely, or shortened back to about 8 inches or 9 inches from the base, with the object of causing one or more fruit buds to develop. Next season the pruner will cut these back to the first fruit bud, and eventually this wood will be another fruit-bearing spur, and yield fruit in 1933.

**Fig. 7.—A 7-year-old apple tree established along modern lines.**

Note the uncut laterals after pruning. Most varieties can be pruned on a similar system, with slight variations according to circumstances.

The grower whose trees carried light crops will need to do some severe thinning out of both spurs and laterals, more particularly fruit spurs, otherwise the trees will carry too much fruit next season, and very little the following. The pruner can regulate the development of blossoms to a very considerable extent. Probably it would be wise to remove half of the fruiting spurs this year, and leave a fairly large number of shortened laterals which, in the ordinary course of events, will send forth more growth and fruit buds during the coming summer. The harder these laterals are cut back, the stronger will be the growth from one or more of the remaining buds. Under the circumstances, then, it would be best to cut them to about 12 to 14 inches, according to the variety and growth of the tree, but in doing this, the pruner must not overlook the removal of the unnecessary fruit spurs.

As previously stated, one cannot lay down any hard and fast rule in regard to pruning, on account of the varying conditions, and each orchardist must exercise his own judgment when he deals with individual trees. The hints here given regarding thinning out can, however, be adopted in all districts, and varied according to conditions.

# Tick Beans as a Green Manurial Crop

*By V. L. Lawrey, Citrus Supervisor.*

THE accompanying illustration shows a very fine crop of tick or horse beans (*Faba vulgaris arvensis*) grown as a green manurial crop in the orange grove of Mr. P. Meakin, Tongala. The seed was sown in April, 1930, at the rate of one bushel to the acre. Superphosphate at the rate of 180 lb. per acre was applied with the seed. During the following September, when the crop had grown to the stage shown, it was rolled and ploughed under.

The value of returning such a crop to the soil is very great, since most of our soils are naturally deficient in humus. An additional advantage is that the tick bean, being a legume similar to the field pea, has the power of absorbing free nitrogen from the atmosphere and making it available in the soil for other crops.

The accepted complete manure for citrus trees is farm-yard manure, and where available this is used almost exclusively, except in some cases where artificial nitrogenous fertilizers are added, as is the case at Doncaster and the surrounding districts, where lemons are grown so successfully.

The reason farm-yard manure is used more extensively for citrus culture in the Doncaster district than in any other is purely one of availability of supply. Because of the comparatively short distance from Melbourne, and the fact that orchardists are able to cart their own supplies, it can be delivered on the groves at a reasonable price. The limited supply of stable manure and the heavy freight charges put it beyond the reach of the growers in the northern districts, only very few of whom can obtain locally sufficient for their requirements.

The constituents of stable manure vary considerably with the condition of the manure, but, taken generally, they are—15 to 20 lb. of nitrogen, 6 to 12 lb. of phosphoric acid, and 9 to 18 lb. of potash per ton. The water content is usually from 60 to 80 per cent.

**A Crop of Tick Beans at Tongala.**

The actual value of the manure cannot be gauged from the plant food content only—the amount of humus matter has also to be taken into consideration. This humus matter is of great value to the soil, and as it is constantly undergoing a process of decay needs replenishing at frequent intervals. In clay soils the physical condition is greatly improved by the opening up of the soil, with consequent greater bacterial activity. On light sandy soils a reverse effect is obtained, and the particles of soil are bound closer together. As the water holding capacity of humus matter is very great, it helps materially when incorporated with the soil in holding soil moisture.

As the northern growers cannot obtain sufficient farm-yard manure for their requirements a substitute has to be applied, and this

[*Continued on page* 253.

# Selecting Poultry-Breeding Stock

*By W. C. Rugg, Poultry Expert.*

A Fine Australorp Sire.

SUCCESS in the poultry business depends to a large degree on one's ability to rear good pullets. If good strong vigorous pullets can be placed in the laying sheds in the autumn the first step towards a successful financial year will have been taken. To produce good pullets and have them ready to lay early in the winter one must breed them from strong virile stock.

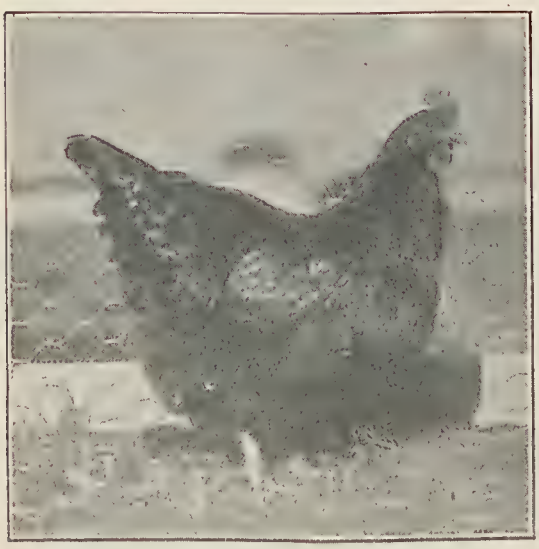
The three most important things to consider when selecting breding stock are—(1) standard size for the breed; (2), constitution and vitality, and (3) pedigree or egg record of the ancestors.

Unfortunately, there are some poultrymen who regard the number of eggs a hen may produce as the only indication of her value as a breeder, and many have made this their sole basis of selection, with disastrous results. It is a well known fact that, if any quality in a bird is stimulated to excess (which is possible up to a point and for a limited time) and other qualities that are needed are not developed to a similar degree, there is sure to be a breakdown. For instance, if selection is made on egg records alone, and only the highest producers are used as breeders, without giving due consideration to the birds' size and constitution, the stock must deteriorate.

It is the experience of many men who have carried out line breeding for egg production that there has been a tendency for the birds to deteriorate in size, and although in some instances there have been produced individual birds of good size and possessed of high egg-laying ability, the majority of the progeny were small in size and of low-producing ability. On many farms this continuous selection of high scoring hens without giving sufficient consideration to the other qualities needed, such as standard size for the breed and vigorous constitution, has resulted in the production of a large percentage of undersized, weedy White Leghorns and Australorps, out of which it is impossible to make a profit.

The poultry farmer should remember that his pullets and hens are simply the machines he employs to manufacture the raw materials —grain, &c.—into the finished product—eggs. He must remember also that to be profitable as egg producers these machines must be able to lay in twelve months eggs approximately five times their own weight—we have many authentic records of birds having laid ten times their own weight in a year. It can be readily understood, therefore, that it is most important that only birds of sound constitutional vigour and vitality should be selected.

Unless a bird is typical of its breed, strong and robust, and has gone through the stages of development without sickness of any kind, it should be discarded as a breeder. Many people assert that birds for egg production can be picked on certain visible characteristics, such as type, measurement of certain bones, &c. My experience from observation of hundreds of birds in trap nests and single pens leads me to the conclusion that high egg producers know no set type by which we can tell them with



The Ideal Australorp Breeding Female.

certainty. It is surprising the number of hens that possess many of the outward characteristics generally considered necessary in a good layer, yet fail to produce even a fair number of eggs, even when fed and housed under the best conditions.

It is essential for the breeder to bear in mind that the various characteristics of the chicken may be inherited separately. It is possible for a pullet to inherit many of the characteristics of a good layer and yet not inherit the factor for high egg production; so the first essential is to select for breeding, birds that have the characteristics wanted, and the next thing is to test their power to transmit those characteristics. Quality and increased production can be bred into fowls just as surely as high butter-fat production can be bred into dairy heifers.

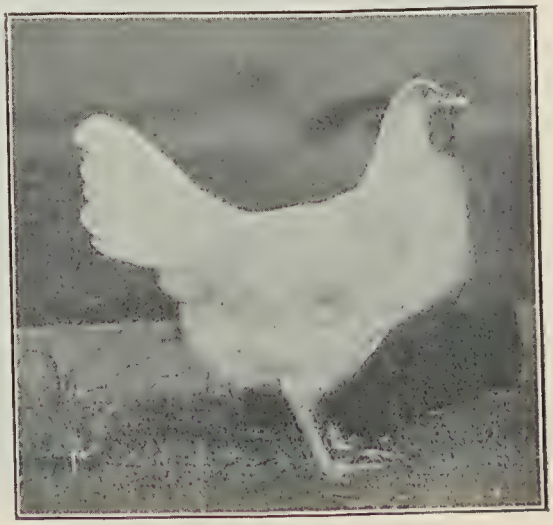
The practice of introducing fresh male birds among their flocks every season has been common among farmers and ordinary poultry-keepers. When carried out systematically, the effect in some instances has been beneficial, but in many it has failed, because the males have been selected for racial characteristics rather than for inherent productiveness.

All experience goes to show that the male is more than half the strain, and that he must be looked to for improvement, primarily because of the fact that, unlike the hens, he has not been forced or selected for production through, perhaps, many generations. It is undoubtedly true that the male is the most potent in respect to coloration of plumage and external characteristics, and there is strong evidence that he has a great influence on numbers and size of eggs produced by his daughters.

Before he uses a male bird in his breeding pens the poultryman should know the egg production record of its dam, both as to numbers and size of egg. Both these factors, I believe, are transmittable characteristics.

Just as the progressive dairy-farmer is seeking bulls bred from ancestors with high butter-fat records, so is the progressive poultryman seeking birds that have been bred from long lines of ancestors noted for high production of full-sized eggs.

In outlining a few of the principal features to be sought when selecting a breeder, let me say, first of all, that I prefer to see the bird on the ground in a natural position, so that I can see whether it has a good outline for its breed, and is of correct size. The bird should be alert and active, close in feather, with legs fairly wide apart, toes well spread, and the shanks flat rather than round. The head is the best index as to quality—it should be of good shape with the skull well defined; a good full round eye, prominent, and well up to the top of the head; the face clean and beak strong. Having found these qualities, I want to handle the bird, and to find that it has plenty of width across the back, and a



Good Specimen—Leghorn Female.

deep body. This is the part of the body which contains all the vital organs—heart, lungs, and digestive apparatus—and if the hen is to develop speed as a layer it must be roomy. She must, therefore, possess depth of rib. There should be good width from the point of the breast bone to the pelvis bones, and the breast bones should be perfectly straight and firm. The pelvic bones also should be straight, pliable, and free from flesh or gristle.

All these points are desirable, but it is hard to find them all in individual birds. The best we can do is to choose a hen with as many of these desirable qualities as possible, and then select a male bird strong in the qualities in which the hen is weak. A question frequently asked is, how many hens should be mated to a male? This depends largely on the individuality of the male, but I am convinced that a number of breeders do not make sufficient use of their male birds. Better results often are obtained by increasing the number of hens in the pen. A good vigorous Leghorn cockerel can, as a rule, be mated to fifteen to twenty hens, with satisfactory results, provided the birds have free range or good yards with natural shelter in them. With Australorps we get good results, when mating one cockerel with ten to twelve hens.

For many years I have been advising poultrymen to pay more attention to breeding for standard size in utility White Leghorns, because size of egg in a great measure follows the size of bird. It is generally known that in utility birds the danger of small eggs increases with every ounce the bird is under the standard weight for the breed. I am glad to say that a great improvement is taking place in the size of Leghorns on most farms through the State; consequently, a great all-round improvement in the size of eggs also has taken place. April and May are the best months in which to select the birds for breeding purposes for the coming season. They should be separated from the laying flocks and given a complete rest from

**Breeding Pens—State Research Farm, Werribee.**

egg production. During this time they will moult.

Many people do not like to separate their hens at this time of the year, and to ease them up just at a time when prices for eggs are rising. They must realize, however, that if they want good sturdy chickens at the right time of the year, they must be prepared to sacrifice those few eggs from their breeding hens and allow them to rest.

Having selected the hens for next year's breeding, it is necessary that they be so prepared that they will be in the best physical condition to produce strong, healthy chickens at the right time of the year, which is July, August, and September. Probably the ideal month for hatching for profitable egg production is August; but as it is not possible on most poultry farms to hatch the number required in one month, it is better to start in July than to hatch a lot of chickens late in the season. These are usually more difficult to rear, and those that are reared seem to be more susceptible to disease.

Many poultry-farmers are afraid to hatch in July, as they consider the pullets will all go into a false moult. My experience, however, is that all July hatched pullets do not moult, and those that do will have laid a sufficient number of eggs to show a profit over their keep for the time they are in moult. July hatched pullets usually come into lay about Christmas or early January, just at the time the older hens are easing off in production, and so help to keep up the supply of eggs. The July hatched cockerels can be marketed when thirteen to fifteen weeks' old, about November, when high prices are ruling—very often, indeed, the prices received then are sufficient to pay the cost of rearing the pullets. In my opinion, July hatching has many more advantages than disadvantages. Only hens that have gone through at least one laying season should be used as breeders. It is a mistake to use pullets for breeding birds for egg production.

In conclusion, I would point out again that all can help by keeping the small egg out of the industry. This great danger can be combated by never using for hatching purposes an egg that does not weigh 2 oz., by never using a male bird whose mother did not lay 2-oz. eggs, and by insisting, when purchasing stud birds, that they be bred from hens that have laid eggs at least 2 oz. in weight.

Finally, remember that, though high records are desirable, type and constitution are absolutely essential to the poultryman who wishes to make a success of his business.

**A Typical Utility Leghorn Sire.**

# Salvaging Sheep Skins

*By J. C. MARSHALL, Inspector of Stock.*

FOR some time past sheep and lamb skins and pelts have had a very low market value, and in districts where transport is at all costly there has been difficulty in selling them at any price. In some instances where they have not been properly stored they have been attacked by weevils and other vermin, and have had to be destroyed. There are many ways in which these skins might be used on the farm, and if properly treated the time spent on them will amply repay the farmer.

It is very important that the skin be carefully removed from the carcass. It should be of good shape, free from knife score-marks, cuts, holes, and ragged edges. To dress an animal after bleeding, turn it on its back in a clean place. Holding the leg between his knees the operator should open the skin on the fore legs from the knee to the chin; the skin on the hind legs should be opened from hock to crutch. In the case of the fore legs a little opening out with the knife is necessary, and the piece of skin overhanging the brisket should be pulled well up with one hand, and the other hand forced between the skin and the breast well back almost to the crutch. When the second front leg is being skinned the neck should be opened and the gullet secured by tying a knot in it; this will prevent the paunch contents escaping and soiling the carcass as well as the pelt or skin. When the legs are opened out insert a gambrel into the hocks of the carcass, and lift it on to a hook, high enough to allow the head to swing clear of the floor. After splitting the skin down and knifing a little round the flanks and thumping the skin out from the fore-quarters, use the knife a little to clear round the tail, and the skin will then almost peel off. Where a skin or pelt is intended for farm use, it should be trimmed around the edges and the leg pieces removed. The pelt should also be squared and freed from any adherent flesh or fat. It must then be hung on a wire or over a rail in a cool, draughty, shady place to dry.

If it is intended to keep pelts or skins for any length of time, they should be sprayed or painted with an arsenical preparation in order to protect them from weevils and other vermin. A satisfactory spray can be made by adding 1 lb. of arsenic and 3 lb. of soda to 5 gallons of water. If preferred, arsenate of soda, procurable at most country stores, may be used at a strength of 1 lb. to 5 gallons of water. Another suitable preparation can be made as follows:—Dissolve 1 lb. of arsenate of soda in 5 gallons of cold water; place 1 lb. of bitter aloes in 2 gallons of water, and boil until the aloes are dissolved; then add 1 pint of the aloes mixture to every 5 gallons of the arsenate of soda mixture. The spray is then ready for use. Paint or spray on the flesh side only.

Prior to commencing the semi-tanning process, any surplus wool should be removed from the skins. If they are to be used for lining cow- or horse-rugs and such like, wool from half to three-quarters of an inch should be left on them, but if required for mats or special purposes the full length of wool may remain. To remove the surplus wool lay a skin out on a flat board or bench, and shear with a sharp pair of shears or good big scissors.

One of the methods employed for processing or semi-tanning sheep and lamb pelts or skins is to immerse the skin in a liquid made as follows:—Place 3 gallons of water in a clean petrol or kerosene tin, and add about 2 lb. of bran; boil for five minutes, and strain off the bran (which may be used for feed purposes). To the liquid add 1½ pints of "spent" sulphuric acid and two cupfuls of common salt; then fill the tin with cold water so as to make in all about 4 gallons of mixture, which should be stirred well and allowed to cool.

Immerse the skin in this solution, and allow it to remain in it from two to six days, according to the thickness of the skin. Age and sex of the animal from which the skin is taken will be a guide to the length of time required for the process. The skin should

be completely immersed, and to ensure the process taking place evenly the skin must be turned daily. No part of the flesh side should be out of the liquid at any time.

"Spent" sulphuric acid is the acid that has been used for testing the butter-fat content of milk, and is a mixture of about equal quantities of partially used sulphuric acid and broken down milk. It may be obtained free from the local herd-tester or from butter factories; it is a waste product, and is usually thrown away. This spent sulphuric acid when diluted about five times makes a good weed-killer, and is very suitable for destroying weeds on garden paths. Commercial sulphuric acid with a specific gravity of approximately 1.83 may be purchased at most country stores. The price ranges from 3d. to 4d. per pound. This may be used in place of the spent sulphuric acid, but care must be exercised in its use. About one-fifth of the quantity of commercial sulphuric acid may be used instead of the quantity of spent sulphuric acid prescribed. Never add water to sulphuric acid, but add the sulphuric acid slowly to the water or whatever liquid is being used.

After the pelts or skins have been in the processing liquid for from two to six days remove them, and rinse them in cold water and allow them to drain in a shady place. Squeeze any surplus water from the wool, and when the skin is still soft and about half dry rub or swab on the flesh side a mixture of soap suds and oil made as follows:—

To a gallon of warm soap suds add one cupful of neatsfoot oil or engine oil. If neither of these oils is available use sump oil from a motor car. Mix the suds and the oil well and swab on the flesh side of the skin; then fold up flesh side to flesh side and leave for 24 hours. Repeat the swabbing two or three times with an interval of 24 hours between each and then allow the skin to dry off in a cool shady place. Work or knead the skin several times during the drying off process. After drying, the skins or pelts can be used for rug lining.

If it is intended to use the skins for household mats or rugs, plenty of kneading and working during the drying process is necessary. To make a skin very pliable, lay it out on a firm flat bench or slab, and rub the flesh side well with a piece of smooth brick. The rubbing will help to remove the hard binding tissue, and so make the skin softer and more pliable.

On the dairy farm where bag or wool-pack rugs are used, two or more skins or pelts fastened together and sewn on the under side of the rug with the wool side outward would be warm and cosy, especially for winter use. The body temperature of the dairy cow is fairly constant during summer or winter, and in cold weather to keep up the body warmth the animal uses much of the heat derived from the food eaten. If the body temperature can be maintained without the animal's drawing too much on the food consumed, there will be much more available for laying on condition or for milk production.

As skins and pelts of little or no commercial value can at small expense be utilized for household purposes and for protection of animals during wintry weather, they should never be destroyed or just thrown about to rot and collect vermin.

# Eliminating Unprofitable Fruit Trees

*By J. M. WARD, Superintendent of Horticulture.*

IN discussing such a subject as the elimination of unprofitable fruit trees, one cannot ignore the fact that few fruit trees are profitable at the present time. That, however, is not the fault of the majority of trees, nor of the growers—rather is it due to something over which the producers have no control. The general financial depression which has affected all primary producers so much, and which has made most branches of orcharding unremunerative, will, we all hope, soon pass, and fruit production again become profitable. In the meantime it behoves orchardists to take careful stock of their trees and eliminate the type or variety of tree that is not wanted—the one that will not pay for its keep, even under favorable conditions. This applies to all kinds of fruits—deciduous, citrus, and vine.

The writer recently visited an orchard of over 50 acres in area, in which there were at least 50 varieties of fruit trees. These included some twenty varieties of apples, the remainder consisting of several varieties of plums, pears, cherries, almonds, peaches, and lemons. This particular orchard, which can be taken as typical of a number of orchards in Victoria, has been particularly unprofitable, because of mismanagement from the planting onwards, and, although originally an excellent property and despite its close proximity to Melbourne, it could be purchased to-day for less than one-quarter of its cost.

This property, which will serve well for the purpose of this article, was purchased by a professional city man, who wanted to make it

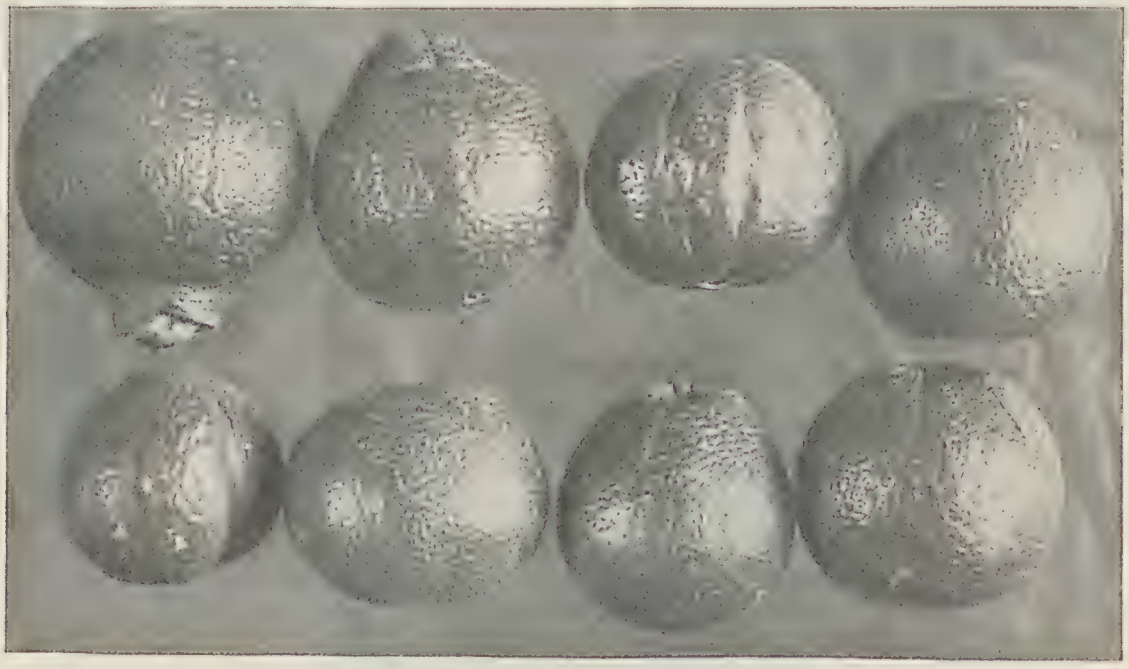


**Fig. 1.—Eight Navel Oranges picked from one Tree.**

Such oranges are known as "off type" navels. The raised sections of the rind are due to bud mutation. Indiscriminate selection of bud-wood is responsible for the tree producing the type of fruit featured in this illustration.

**Fig 2.—An Apple Tree cut hard back and grafted, which became affected with *Polystictus versicolor*.**

a commercial proposition. The situation and soil were ideal for commercial orcharding. The initial mistake made was in the selection of varieties. It appears now as if, at the time of planting, the intention of the owner was to sell his fruit on the local and overseas markets, and to give each market a different kind of fruit every week. At any rate, one is justified in arriving at such a conclusion, after taking stock of the varieties of fruits, and more particularly of apples.

One can be forgiven for making, through lack of knowledge, a wrong selection of kinds to plant; but that one should continue to retain these for a period of some 30 years is beyond comprehension. On this particular orchard there are some six to twelve trees of each of a number of varieties, the majority of them producing fruit of very poor quality. The varieties are ones little known in the fruit trade, and buyers do not seek them. Thus they are marketed at a discount. The only variety worth while that has been planted is the Jonathan apple, and these have been put out in one large block without any thought of cross-pollination, consequently they do not yield to their full capacity.

Of the 50 odd acres of the orchard in question, there are not more than 20 acres that yield profitable crops, despite the fact that the trees are quite normal in growth and health. The point I desire to make clear is, that although all the trees have received similar attention by way of cultivation, manuring, disease control, pruning, &c., less than half of them are of any commercial value. In other words, had the owner of this property planted only 20 acres of trees of about four good varieties—six as an absolute maximum—and devoted the same attention to these, he would have now a sounder proposition, and one that, under normal conditions, would have been a paying venture. Even after paying dearly for experience with the assorted fruits, if he had reduced the majority of varieties by re-working them to better known commercial kinds, the early wrong could easily have been righted.

Although I have quoted a particular property, it can be taken as more or less typical of a number of others, especially those planted by the city man, who, apparently, is carried away with the varieties listed in a nurseryman's catalogue.

Whether it be citrus, apples, pears or other fruit, the trade, the world over, recognises a comparatively few varieties that have become well and favorably known to the retailer, who

**Fig. 3.—A Close-up View of the Tree shown in Fig. 2.**

Note the injurious effect from attacks by the fungus *P. versicolor*.

**Fig. 4.—An Apple Tree in the Same Orchard as are those shown in Figs. 2 and 3, only partly cut back.**

Numerous scions were grafted on to each branch. There is no sign of any attack by *P. versicolor*.

will pay a reasonably good price for a continuous supply of the variety he requires for his trade. Odd lines of little known varieties are seldom wanted by any trader; although there are times when he is forced, through circstances, to buy them at lower prices than he is prepared to give for better commercial lines.

With deciduous fruits there is not the same trouble experienced, in what may be termed "off-type" varieties, as is the case with citrus fruits—more particularly navel oranges. The chief trouble with deciduous fruits is the number of poor quality varieties, and the many chance seedlings that come under notice every year. In this regard almost every grower has his own "pet." If a seedling should come up by chance in any one's garden, the owner often considers it is the best ever produced. Later on it is propagated and gradually distributed throughout the country, at considerable cost to the industry, and particularly to those who have a fad for planting so many new and untried varieties. Some idea of the number of kinds of apples and pears growing in commercial orchards in Victoria, may be gained from the fact that last year 63 varieties of apples and 21 varieties of pears were shipped overseas. Many of these would be small parcels of, say, 10 to 50 cases of kinds little known to any one. It is common knowledge that, when buyers abroad make contracts for f.o.b. sales, they stipulate the size and variety required, the latter usually being limited to from four to six kinds. The personal likes and dislikes of growers are not considered by the trade.

In regard to oranges, it is well known there are a number of types that are of poor or even low quality fruit. This can be seen in almost every orange grove in Australia—and elsewhere for that matter; yet in the same grove, side by side with these poor quality trees, can be seen trees bearing high quality fruit. To some extent this can be attributed to the propagator of the trees who has not exercised care in the selection of his buds. (*See* Fig. 1.)

In the Melbourne fruit markets, at certain periods of the year, oranges are sold at prices ranging from 8s. to 18s. per case; those purchased at 18s. per case are of the same variety as the 8s. ones, and the production of both types costs the same amount per case, but the former are of a different type and of higher quality.

**Fig. 5.—Several hundred buds and scions have been placed on this Apple Tree. All new growth now showing is from these scions and buds.**

Sufficient has been said to justify the elimination of non-commercial varieties. In considering this matter, growers should bear in mind that a "dud" tree costs as much to keep as does a good tree. Apart from type and variety, there may be diseased trees, or trees affected with soil or other troubles, that require replacing.

[*Continued on page* 253.

# Orchard and Garden Notes

*By Edward E. Pescott, F.L.S.*

### *Rose Pruning.*

GARDENERS should not be in too great a hurry to prune their rose bushes, for early pruning brings about early development of growth and a consequent liability of attack by aphis. Roses known as hybrid perpetuals usually are pruned early in June, and all other kinds towards the end of the month. Hybrid perpetuals are most suited to gardens of cold climates, such as England, and very few are grown in Victoria. They are generally a large-flowered fragrant type, the bushes producing very few blooms, and, as a rule, only in the spring.

**Fig. 1.—Rose bush before pruning.**

In pruning roses, the following rules should be adhered to:—

1. The more vigorous the variety, the lighter the pruning, and conversely, the weaker a variety, the heavier the pruning.

2. Roses on sandy soils should be pruned more lightly than those on clay soils.

3. The wood on a rose bush should be completely renewed every three or four years.

**Fig. 2.—The same plant as in Fig. 1 with the centre opened out, leaving framework to be pruned and spaced.**

PROCEDURE.

It is not necessary to postpone pruning till all the foliage has fallen; but, should there be any leaves present, it would be just as well to cut them off, in order to leave the bush clear for the operation. The cutting away of all dead and decayed shoots should be the first work; secondly, all thin and weak shoots, especially those which are carrying old seed heads, should be cut out; thirdly, the centre of the bush must be well opened to allow

**Fig. 3.—The same plant pruned. Note the two horizontal sticks placed in as "spreaders" to make the bush shapely.**

ample light and room for growth in the spring; and, lastly, the tip of each shoot should be cut back to an outside bud to help in shaping the trees.

The first and second operations are simple. It is usually the shaping of the bush and the leaving of the right wood that give trouble to the amateur gardener. If he would visualize the ribs of an open umbrella, he would have a very fair idea of what a rose bush should look like when pruning is completed. The limbs that remain should be as evenly spaced as possible. It is, of course, not necessary to have a space, say, of three to four inches between every limb, but even spacing is important, because it allows of subsequent even growth.

Spindly and twiggy shoots are removed, because such growths never produce flowers. It must always be remembered that roses produce blooms first on the new wood produced in the current season; and, secondly, on very strong buds or eyes; therefore, when the pruning of a rose bush is completed, all the weak side shoots should have been thinned out, and only strong main or secondary stems left. When removing these weak side shoots, as well as many of the lateral growths, the cut should be made right at the stem from which the shoot is proceeding. Some people leave short stubby pieces of wood upwards of an inch in length along the course of the shoots, believing that these are required to produce flowers; but this is an error. The main strong shoots always possess sufficient dormant buds to give an abundance of growth and, later, flowers.

Regarding the final pruning of the main and secondary shoots that are left, the pruner in deciding how far he will shorten these back, must consider, first of all, the variety; and, secondly, the vigour of the plant. As stated at the beginning, if a plant is of a strong-growing variety, or has a vigorous individual growth, then it should not be pruned so severely as one that is weak. For instance, roses like Madame Abel Chatenay, Radiance, and Maman Cochet should have only one-third pruned off, while roses like Lena, Richmond, and Lady Battersea should have two-thirds of their growth removed. This, of course, is on the principle that severe pruning encourages growth.

As a final piece of advice, I would remind growers that the secateurs should be thoroughly sharp, so that none of the cuts will be left ragged or rough.

### *The Flower Garden.*

Plantings should be made of stocks, pansies, iceland poppies, wallflowers, and similar plants for winter and early spring flowers. To prevent wilt, the stocks and poppies should be dusted with the copper carbonate dust or with Cheshunt Compound. Stocks and wallflowers will benefit from a lime dusting.

### *The Kitchen Garden.*

Preparation should be made for sowing tomato seeds for an early crop. Seeds of broad beans should be sown in a sunny position. Tops of Jerusalem artichoke plants should be cut, and the tubers left in the ground until required; the tubers quickly shrivel if left exposed to air. Rhubarb may now be transplanted, setting the plants in a very heavily manured soil.

### *The Orchard.*

Preparation should be made for planting out young trees by thoroughly sub-soiling and draining the land. The orchard area, too, wherever necessary, should have a good dressing of lime. In codlin moth areas, sheds and cases should be cleared out to destroy all winter harbouring larvae. It may be well to spray all woolly aphis infected trees with one of the oil sprays unless the aphelinus parasite has been introduced.

# Export Citrus Cases

## A Correction

A slight error occurred in the dimensions of cases to be used for the export of citrus, as given in the *Journal* for April, page 190. The correct dimensions are 24 x 11½ x 11½, inside measurements.

# Professional Papers

[This section is devoted to professional papers and articles of a scientific character.]

# Experiments on the Control of "Stinking" Smut or Bunt

## Part 2. Tests of the Dry Copper Powders

*By R. L. Twentyman, B.Agr.Sc., Department of Agriculture.*

*The first section of this report, which dealt with the design of the experiments and comparisons of the wet and dry pickling methods, appeared in the April issue of this Journal. The following article is confined to experiments dealing with the actual dry pickling powders.*

WITHIN the last few years, dry pickling has become very popular as a means of smut control in this State. The treatment is simple, rapid, and effective, and its widespread adoption has demonstrated that the convenience and advantages of the method have been appreciated. The disadvantages of wet pickling had been realized for many years, and it was not uncommon to find growers sowing unpickled seed, preferring to take the risk of a smutty crop rather than suffer a poor germination. Naturally, a method which was able thoroughly to control the infection, and yet leave the seed quite uninjured, was sure to be used extensively. Such is now the case, and we find that the value of dry pickling having been established, interest in pickling is centered on the actual details connected with the treatment itself rather than on any comparison with the wet treatments.

In order to obtain detailed information concerning the use of the dry copper powders, the Department of Agriculture has conducted an extensive series of experiments designed to furnish information on the following matters:—

1. The quantity of powder necessary to apply for smut control.
2. The relative efficiency of the various brands of commercial powders.
3. The effect of the addition of a diluent to the copper powder.
4. The influence of size of particles on the efficacy of the powder.

All the seed testing was carried out under actual field conditions, the experiments being conducted at the Rutherglen and Werribee State Farms and Longerenong Agricultural College. Hand-sown rows were used for testing during the early part of this experiment, but these were soon abandoned in favour of small drill-sown plots which have been used almost exclusively for the past three years.

### The Quantity of Powder necessary to apply for Smut Control.

Tests conducted on this question have very definitely shown that other factors being equal, the efficiency of control was dependent on the amount of powder applied. The results, however, were in accordance with the law of diminishing returns in that the first half ounce of powder per bushel applied resulted in a much greater reduction of infection than did the following moieties.

To obtain satisfactory control of the bunt, the quantity necessary to apply is largely dependent on the amount of smut present on the grain sample. However, the quantity of powder applied cannot be increased indefinitely, as there is a limit to the amount

that the wheat can retain, and there are serious practical objections to the use of excessive quantities. Results obtained from experiments at Rutherglen and Longerenong show that, although light applications of powder gave satisfactory control with a low rate of smutting, this quantity was quite insufficient where the spore dosage had been increased.

Table X shows the amount of smut appearing in hand-sown rows at Rutherglen in 1926. These were sown with Federation wheat with varying smut and powder doses.

TABLE X.—SHOWING PERCENTAGE OF SMUT IN HAND ROWS, RUTHERGLEN, 1926.

| Treatment. | Count of Smutted Plants (Eleven Rows each). | | |
|---|---|---|---|
| | Smutted, 1–100. | Smutted, 1–250. | Smutted, 1–2,000. |
| | % Smut. | % Smut. | % Smut. |
| Smutted unpickled .. | 50·5 | 45·0 | 7·0 |
| ¼ oz. powder per bushel .. | 10·0 | 9·9 | ·8 |
| ½ oz. powder per bushel .. | 8·3 | 5·2 | ·72 |
| 1 oz. powder per bushel .. | 2·7 | 1·35 | ·0 |
| 1½ oz. powder per bushel .. | 2·4 | 2·9 | ·0 |
| 2 oz. powder per bushel .. | 1·7 | 1·15 | ·55 |

Results similar to the above were obtained at Longerenong in 1927 in tests with Dollar seed sown in hand rows at varying smut and powder doses.

TABLE XI.—SHOWING PERCENTAGE OF SMUT IN HAND ROWS, LONGERENONG, 1927.

| Treatment. | Count of Smutted Plants. | | |
|---|---|---|---|
| | Smutted, 1–100. | Smutted, 1–250. | Smutted, 1–1,000. |
| | % Smut. | % Smut. | % Smut. |
| Smutted unpickled .. | 69·2 | 46·1 | 19·6 |
| ½ oz. powder per bushel .. | 25·7 | 4·2 | 1·2 |
| 1 oz. powder per bushel .. | 11·5 | 2·7 | ·65 |
| 1½ oz. powder per bushel .. | 6·8 | 1·37 | ·58 |
| 2 oz. powder per bushel .. | 5·25 | 1·4 | ·2 |

From Table XI., it will be seen that although 1 oz. of powder per bushel reduced the smut to within reasonable limits in the case of the lightly-smutted seed, with the more heavily-smutted seed this rate proved quite inadequate.

Counts made on a large number of small drill plots at Longerenong in 1928 and 1929 gave similar results, the degree of infection being progressively reduced with increasing amounts of powder.

TABLE XII.—COUNT OF SMUT IN DRILL PLOTS, LONGERENONG, 1928, AND 1929.

| Treatment. | Seed Smutted, 1–500. | |
|---|---|---|
| | Federation Wheat. | Dollar Wheat. |
| | 1928. | 1929. |
| | % Smut. | % Smut. |
| Smutted unpickled .. .. | 55·4 | 57·8 |
| ,, + ½ oz. cop. carb. .. | 7·04 | 8·91 |
| ,, + 1 oz. cop. carb. .. | 1·92 | 3·6 |
| ,, 2 oz. cop. carb. .. | ·19 | ·78 |

Although the above tables show very clearly that there is a definite reduction in infection as the amount of powder is increased, they show also that it is quite impossible to specify a minimum quantity of powder that will give satisfactory smut control under all conditions. An amount that may prove satisfactory under one set of conditions may be found quite insufficient under other circumstances. The nature of the soil, the time of sowing, the variety of wheat, and the rate of spore dosage all have an important bearing on the degree of infection.

Throughout the experiments, it has been observed that the time of sowing has an important bearing on the amount of powder it is necessary to apply. Seed sown early before the winter conditions set in is much less liable to infection than that sown later when lower temperatures prevail. In fact, in portions of the State where seeding was commenced on a dry seed-bed before the arrival of the late autumn rains farmers frequently sowed unpickled wheat, and the crop usually escaped infection.

The nature of the soil in which the seed is sown also has a marked influence on the smut infection. In these tests, wheat sown at Longerenong always has given a much higher percentage of infected plants than has similar seed sown at Werribee.

The following table shows the amount of smut which appeared in plots sown with

exactly similar seed at Longerenong and Werribee during 1929:—

TABLE XIII.—PERCENTAGE OF SMUT IN PLOTS SOWN WITH SIMILAR SEED, 1929.

| Treatment. | Dollar Seed Smutted, 1-500. | |
|---|---|---|
| | Longerenong. % Smut. | Werribee. % Smut. |
| Smutted unpickled .. .. | 57·8 | 32·0 |
| ¼ oz. cop. carb. per bushel .. | 13·04 | 2·4 |
| ½ oz. cop. carb. per bushel .. | 8·9 | 1·52 |
| 1 oz. cop. carb. per bushel .. | 3·6 | ·72 |
| 2 oz. cop carb. per bushel .. | ·78 | ·37 |

It will be seen that the infection at Longerenong was very much higher than that at Werribee, but the difference was not so marked between the unpickled plots as between those that had been dry pickled.

The actual manner in which dry copper powders prevent bunt infection is not fully understood, but at the present time it is generally considered that the pickling action of the dry powder is, perhaps, not so much dependent on the actual killing of the spores, as in their delayed germination due to the presence of the copper powder (*Gassner* 7).

The irregularity of smut infection throughout a crop is often very pronounced, and this variation usually has been observed throughout the pickling experiment plots to a greater or lesser degree. Apparently the condition of the soil can serve as a complementary factor to the actual pickling process, and can exert a considerable influence on the vigour of the smut attack. It has often been noticed at Werribee, in plots that had been sown with lightly-pickled smutted seed, and where infection had occurred only to the extent of 1 per cent. or less, that the smutted plants were frequently found in groups of twos or threes along the rows. The smutting and pickling of the seed had been done uniformly, and there were no unbroken masses of infective material present in the sown seed. Hence, excluding the possibility of a secondary infection, it would appear that the probability of finding three smutted plants together by chance in a plot containing so little smut was very small, and evidently some local soil factor, as well as the actual pickling, was largely determining the extent of infection. Similar observations have been recorded in Western Australian experiments (*Southern and Limbourn* 17).

When dry pickling was first introduced, it was advised that not less than 2 oz. per bushel should be used, and this quantity was generally applied. However, it was soon found that most of the dusting machines were not capable of causing this quantity to adhere to the grain, and the surplus dust caused considerable inconvenience. Hence we find throughout the State that there has been a very general tendency among farmers to reduce the quantity, and now many farmers treating reasonably clean seed seldom use more than 1¼ oz. per bushel. This quantity seems to have given entirely satisfactory results, and its success apparently has encouraged others to think that they can safely reduce this quantity still further. So long as the smut dosage of the seed is very light, and the soil conditions are unfavorable for infection, they probably will harvest a clean crop, but should smut spores be present on the seed and the soil conditions prove favorable for their development, some infection is bound to occur.

With obviously smutted seed the full 2 oz. of powder should be used, but with seed comparatively free from smut 1½ oz. per bushel will be found to give satisfactory results.

### Tests with Commercial Powders.

Almost as important as the quantity of the powder used is the question of its quality. There are at present on the market many dry copper dusts sold for pickling purposes, and they are all commonly referred to as "Copper Carbonate." These all contain copper as the active fungicidal constituent, but they exhibit a wide diversity in the actual nature of the copper salt present. The copper content varies from 18 to 54 per cent., and the apparent density from 21 to 67 lb. per cubic foot.

Table XIV. shows the more important chemical characteristics of 14 different powders, together with the weights per cubic foot.

The powder referred to as "Standard Copper Carbonate" is a very fine, high-grade basic copper carbonate which conforms to the standard suggested by the University of California in 1923[14]. A supply of this powder was obtained in 1924, and since then it has been regarded as the standard with which other powders have been compared.

Kilspor, Antibunt, Bunticide, Cuprex, Vitrioline, Aero, Sickle, Smutol and Lux are ordinary commercial powders as sold for pickling purposes. Old Kilspor and Old Vallo represent samples of powders that were sold

TABLE XIV.—CHEMICAL AND PHYSICAL PROPERTIES OF COMMERCIAL POWDERS.

| Name. | Major Ingredient. | Copper. | $CO_2$. | $SO_3$. | Water Soluble Salts. | CaO. | Weight per Cubic Foot. |
|---|---|---|---|---|---|---|---|
| "Stand. Cop. Carb." .. | Basic cop. carb. .. .. | 53·7 | 17·0 | 2·2 | 1·6 | 1·2 | 30·1 |
| Kilspor .. .. | Basic cop. sulph. .. .. | 47·5 | 3·7 | 17·2 | 8·5 | .. | 52·6 |
| "German" C.C. .. .. | Basic cop. carb. .. .. | 47·6 | 18·1 | 3·3 | 4·6 | .. | 38·2 |
| Antibunt .. .. | Basic cop. carb. .. .. | 52·2 | 18·2 | ·62 | 2·6 | .. | 33·5 |
| Bunticide .. .. | Basic cop. carb. and sulph... | 40·4 | 16·8 | 8·0 | 7·5 | 10·5 | 48·3 |
| Cuprex .. .. .. | Basic cop. carb. and sulph... | 53·4 | 10·2 | 8·2 | ·7 | .. | 46·0 |
| Anhy. cop. sulph. .. | Anhydrous cop. sulph. .. | 39·5 | .. | .. | .. | .. | .. |
| Vitrioline .. .. | Copper acetate .. .. | 17·9 | .. | .. | 56·9 | .. | 54·4 |
| "Electro Zinc" .. .. | Basic cop. sulph. .. .. | 48·1 | ·6 | 18·1 | 4·1 | .. | 67·4 |
| Aero .. .. .. | Basic cop. sulph. .. .. | 53·9 | 2·1 | 9·7 | ·5 | .. | 40·0 |
| Sickle .. .. .. | Basic cop. carb. .. .. | 49·4 | 17·3 | 4·3 | 8·6 | .. | 33·8 |
| Old Kilspor .. .. | Basic cop. carb. and sulph... | 52·0 | 15·0 | 6·5 | 4·7 | .. | 41·2 |
| Old Vallo .. .. | Basic cop. carb. .. .. | 48·9 | 19·9 | 2·5 | 1·9 | 5·5 | 58·0 |
| Smutol .. .. .. | Cop. oxychloride .. .. | 54·2 | .. | .. | 3·8 | .. | 21·0 |
| Lux .. .. .. | Basic cop. sulph. .. .. | 42·2 | 4·5 | 19·2 | 6·3 | 8·3 | 54·6 |

some years ago, and the testing of these two particular powders has been continued. "Electro Zinc," a basic copper sulphate, was an experimental product of the Electrolytic Zinc Company. Anhydrous copper sulphate was included for the purpose of comparison. Naturally it was expected that with such variable materials there would be found considerable differences in their efficiency as bunticides, and in order to obtain information on this point, the efficacy of the 14 different powders was tested under field conditions.

Tests with these powders were conducted at Longerenong in 1927, 1928, 1929, and 1930, the powders being applied at the rates of ½, 1, and 2 oz. respectively per bushel. Before pickling, the seed used was smutted at the rate of 1-500 and sowing was done in drill plots 5 hoes wide and ¾ chain long.

In the early experiments comparisons were made using unpickled plots as checks, but it was soon realized that the presence of a large number of unpickled plots throughout the experiment was very objectionable. Not only was the unpickled seed a potential source of contamination of the pickled plots right throughout the experiment, but in view of the large differences between the actual amounts of infection in the pickled and unpickled plots at harvest, the comparison afforded by them was most unsatisfactory. For this reason, in the 1928 experiments, the control plots were sown with seed which had been treated with a similar quantity of a high-grade powder, i.e., "Standard Copper Carbonate."

In 1928 and 1929 most of the estimates of the smut infection were made by means of a count of heads in sample bundles taken from the plots, the samples being sufficiently large and representative of the plots to ensure the accuracy of the estimates. (See previous section of this article in April *Journal*.) In 1930, estimation was made by means of a count of the total number of infected plants per plot.

The figures for "bunticidal value" shown for the years 1928 and 1929 have been calculated by comparing the amounts of smut present in the treated plot with the mean of its adjoining check plots. Then from a graph of the mean amounts of smut present in all the ½ oz., 1 oz., and 2 oz. check plots and the unpickled plots respectively, the relative control obtained with the powder under test was given a value in terms of "Standard Copper Carbonate." Expressing the mean control of the adjoining check plots as 100, bunticidal values for the various commercial powders have been calculated. Using a powder, having the value of 50, at the rate of 2 oz. per bushel would give only the same control as the standard copper carbonate used at the rate of 1 oz. per bushel.

Tables XV., XVI., and XVII. show the amounts of smut recorded in the Commercial Powder Plots at Longerenong in 1928, 1929, and 1930.

The results obtained in 1928 and 1929 agreed fairly closely. In 1930 all plots were treated with 1 oz. per bushel, and it was not possible to calculate "bunticidal values" for the various powders, so that these results show only the relative amounts of smut present. It will be seen that while some powders have not

TABLE XV.—SHOWING COUNTS OF SMUT IN COMMERCIAL POWDER TEST PLOTS, 1928–29.
(*Seed smutted* 1-500).

| Powder. | Federation, 1928, Counts of Duplicate Plots. | | | Dollar, 1929, Counts of Duplicate Plots. | | | Bunticidal Value. Standard Cop. Carb. = 100. | |
|---|---|---|---|---|---|---|---|---|
| | ½ oz. per Bushel. Mean per cent. Smut. | 1 oz. per Bushel. Mean per cent. Smut. | 2 oz. per Bushel. Mean per cent. Smut. | ½ oz. Mean per cent. Smut. | 1 oz. Mean per cent. Smut. | 2 oz. Mean Infected Plants per Plot. | 1928. | 1929. |
| 1. Check Stand. Cop. Carb. | 4·62 | 1·75 | ·14 | 10·06 | 4·62 | 11·0 | 100 | 100 |
| 2. Kilspor .. .. | 5·92 | 3·0 | ·2 | 8·53 | 3·04 | 13·0 | 94 | 99 |
| 3. Check S.C.C. .. .. | 6·68 | 1·95 | ·35 | 6·68 | 3·53 | 6·5 | .. | .. |
| 4. German .. .. | 11·65 | 2·9 | ·58 | 10·55 | 4·71 | 10·0 | 81 | 82 |
| 5. Check S.C.C. .. .. | 7·56 | 1·6 | ·3 | 9·88 | 3·78 | 8·0 | .. | .. |
| 6. Antibunt .. .. | 9·23 | 1·8 | ·2 | 8·9 | 3·53 | 6·5 | 95 | 102 |
| 7. Check S.C.C. .. .. | 6·46 | 2·45 | .. | 8·3 | 3·29 | 4·5 | .. | .. |
| 8. Bunticide .. .. | 12·7 | 7·1 | 1·95 | 11·29 | 5·4 | 27·5 | 58 | 71 |
| 9. Check S.C.C. .. .. | 5·18 | 1·65 | ·6 | 10·37 | 4·53 | 9·0 | .. | .. |
| 10. Cuprox .. .. | 9·09 | 4·25 | ·63 | 8·89 | 4·36 | 24·0 | 74 | 101 |
| 11. Check S.C.C. .. .. | 5·23 | 2·55 | .. | 10·04 | 3·86 | 16·5 | .. | .. |
| 12. Anhyd. $CuSO_4$ .. | 3·7 | 1·6 | ·15 | 9·31 | 2·41 | 7·5 | 127 | 120 |
| 13. Check S.C.C. .. .. | 8·6 | 1·55 | .. | 10·6 | 3·21 | 18·5 | .. | .. |
| 14. Vitrioline .. .. | 14·7 | 10·75 | 4·1 | 15·3 | 9·05 | 48·0 | 51 | 55 |
| 15. Check S.C.C. .. .. | 8·15 | 1·5 | ·3 | 10·95 | 3·76 | 11·5 | .. | .. |
| 16. Unpickled .. .. | 52·5 | 55·7 | 58·0 | 55·4 | 59·6 | 58·2% | .. | .. |
| 17. Check S.C.C. .. .. | 5·6 | 1·85 | ·3 | 9·55 | 2·9 | 13·5 | .. | .. |
| 18. "Electro Zinc" .. | 14·55 | 5·2 | ·85 | 13·27 | 4·8 | 26·0 | 57 | 69 |
| 19. Check S.C.C. .. .. | 7·0 | 1·6 | .. | 8·31 | 3·39 | 13·5 | .. | .. |
| 20. Aero .. .. | 6·9 | 3·1 | ·5 | 10·1 | 2·56 | 14·5 | 88 | 98 |
| 21. Check S.C.C. .. .. | 6·95 | 1·2 | .. | 10·32 | 3·25 | 12·0 | .. | .. |
| 22. Sickle .. .. | 15·5 | 9·25 | 1·05 | 15·25 | 5·78 | 25·0 | 51 | 62 |
| 23. Check S.C.C. .. .. | 7·0 | 2·15 | .. | 10·11 | 3·58 | 11·0 | .. | .. |
| 24. Old "Kilspor" .. | 11·45 | 3·8 | 1·15 | 11·29 | 4·09 | 26·5 | 81 | 75 |
| 25. Check S.C.C. .. .. | 7·35 | 2·1 | ·1 | 6·22 | 2·74 | 11·5 | .. | .. |
| 26. Old "Vallo" .. | 16·75 | 7·0 | 2·4 | 8·75 | 6·66 | 40·5 | 67 | 73 |
| 27. Check S.C.C. .. .. | 9·6 | 2·4 | ·25 | 8·85 | 4·30 | 15·0 | .. | .. |
| 28 Smutol .. .. | 9·6 | 3·1 | ·2 | 7·49 | 2·98 | 10·0 | 96 | 106 |
| 29. Check S.C.C. .. .. | 8·8 | 1·75 | ·8 | 6·33 | 2·82 | 9·5 | .. | .. |
| 30. Lux .. .. | 12·0 | 4·4 | 1·25 | 11·23 | 6·13 | 31·0 | 69 | 63 |
| 31. Check S.C.C. .. .. | 7·9 | 1·18 | .. | 6·09 | 4·06 | 12·5 | .. | .. |

given as good relative control as in the previous years, the 1930 results in general confirm those of the previous trials. Table XVII. shows that there is a considerable difference in the efficiency of the various brands of copper powders, the better powders being approximately twice as good as the poorer ones. Still, it will be seen that, on the whole, most of the pickling powders sold in this State are of good quality. The tests have not revealed the presence of any completely ineffective powders, for even the poorest of them possess sufficient bunticidal power to give satisfactory control when applied to ordinary seed wheat at the rate of 2 oz. per bushel. But this same control could be obtained with half the quantity of the better powders.

With one exception, the results obtained in these efficiency trials can all be explained by a chemical and physical examination of the powders. The exception is "Sickle" brand, a powder which chemically appears to be satisfactory and is also in a very fine state of subdivision, yet has given only poor results.

Although anhydrous copper sulphate has given effective control, the objectionable nature of the dust arising from this material is a serious obstacle to its use.

## Dilution of Copper Powders.

Ever since the introduction of the dry pickling method, considerable interest has been taken in the question of adding diluents to the powders, and from time to time diluted powders have made their appearance on the market.

Generally the material has been referred to as a distended rather than as a diluted powder, the suggestion evidently being that the

bunticidal value of the resultant powder has not been seriously reduced by the addition of the dispersing agent, filler or diluent. As early as 1923, Mackie and Briggs published results of experiments in California, in which they recorded that gypsum or lime added to copper carbonate decreased its efficiency as a bunticide in proportion to the amount added. Since then other workers (1, 9, 10, 16) have claimed to have obtained almost as good results with the low-grade powders as with those containing 50 to 55 per cent. of copper. It would appear, however, that these statements are based largely on the results of experiments which have failed to produce sufficient smut to show up the differences between the varying powders.

TABLE XVI.—COUNTS OF SMUT IN COMMERCIAL POWDER PLOTS, 1930.

*Dollar seed smutted* 1-500. *Estimation by count of total infected plants per plot.*

| Powder. | 1 oz. Powder. Smut. | 1 oz. Powder. Smut. | 1 oz. Powder. Smut. | 1 oz. Powder. Smut. | Mean Relative Amount of Smut, Check plots = 100. |
|---|---|---|---|---|---|
| | % | % | % | % | |
| Check Stan. Cop. Carb. .. | 1·23 | 1·81 | 2·32 | 1·87 | .. |
| Kilspor .. .. | 3·26 | 2·83 | 3·70 | 4·78 | 198 |
| Check S.C.C. .. | 1·59 | 1·23 | 2·32 | 2·54 | .. |
| German .. | 3·19 | 2·9 | 3·84 | 2·68 | 139 |
| Check S.C.C. .. | 2·9 | 2·10 | 3·33 | 2·54 | .. |
| Antibunt .. | 1·87 | 2·32 | 2·32 | 2·17 | 87 |
| Check S.C.C. .. | 1·45 | 2·61 | 3·19 | 2·17 | .. |
| Check S.C.C. .. | 2·03 | 2·17 | 3·62 | 3·33 | .. |
| Cuprex .. .. | 3·19 | 1·87 | 3·77 | 4·93 | 135 |
| Check S.C.C. .. | 1·74 | 1·81 | 2·97 | 3·12 | .. |
| Anhyd. $CuSO_4$* .. | 2·83 | 1·63 | 2·97 | 2·97 | 113 |
| Check S.C.C. .. | 1·45 | 1·88 | 3·04 | 3·91 | .. |
| Vitrioline .. | 4·42 | 6·31 | 7·68 | 8·48 | 311 |
| Check S.C.C. .. | ·94 | 2·03 | 2·10 | 2·75 | .. |
| Bunticide .. | 4·28 | 4·64 | 6·24 | 6·31 | 232 |
| Check S.C.C. .. | 2·83 | 2·25 | 2·97 | 2·97 | .. |
| Check S.C.C. .. | 2·39 | 1·74 | 2·03 | 1·52 | .. |
| Old Kilspor .. | 2·68 | 3·55 | 3·55 | 4·06 | 171 |
| Check S.C.C. .. | 3·19 | 2·46 | 1·52 | 2·17 | .. |
| "Electro Zinc" .. | 5·51 | 5·51 | 4·06 | 6·24 | 194 |
| Check S.C.C. .. | 2·83 | 3·48 | 3·04 | 4·86 | .. |
| Aero .. .. | 4·28 | 3·91 | 3·62 | 5·43 | 140 |
| Check S.C.C. .. | 1·96 | 2·68 | 3·26 | 2·9 | .. |
| Sickle .. .. | 6·45 | 5·94 | 5·22 | 7·39 | 243 |
| Check S.C.C. .. | 2·17 | 2·39 | 3·04 | 3·04 | .. |
| Check S.C.C. .. | 3·04 | 2·32 | 3·48 | 2·10 | .. |
| Old Vallo .. | 7·25 | 4·56 | 7·39 | 5·22 | 251 |
| Check S.C.C. .. | 1·59 | 2·25 | 2·61 | 2·10 | .. |
| Smutol .. .. | 2·75 | 3·98 | 2·32 | 3·12 | 152 |
| Check S.C.C. .. | 1·59 | 2·39 | 2·32 | 1·59 | .. |
| Lux .. .. | 4·28 | 3·48 | 4·56 | 3·41 | 177 |
| Check S.C.C. .. | 3·33 | 2·46 | 2·32 | 1·87 | .. |

Experiments conducted by this Department have shown quite definitely that there is a progressive reduction in the bunticidal value with the increasing proportion of diluent. The powder used in these tests was a high-grade basic copper carbonate, and it was intimately mixed with varying quantities of precipitated chalk so as to form mixtures containing 75, 50 and 25 per cent. copper carbonate respectively. A 37 per cent. powder also was included in the tests of 1928.

TABLE XVII.—SUMMARY OF TABLES XV. AND XVI., SHOWING EFFICIENCY OF THE VARIOUS POWDERS.

| Powder. | Bunticidal Value, 1928. | Bunticidal Value, 1929. | Relative Amounts of Smut, 1930. |
|---|---|---|---|
| "Anhydrous" Cop. Sulph. | 121 | 120 | 113* |
| Antibunt .. .. .. | 95 | 102 | 87 |
| Smutol .. .. .. | 96 | 106 | 152 |
| "Standard Cop. Carb." .. | 100 | 100 | 100 |
| Cuprex .. .. .. | 74 | 101 | 135 |
| Aero .. .. .. | 88 | 98 | 140 |
| Kilspor .. .. .. | 94 | 99 | 198 |
| German .. .. | 81 | 82 | 139 |
| Old Kilspor .. .. | 81 | 75 | 171 |
| Old Vallo .. .. | 67 | 73 | 251 |
| Lux .. .. .. | 69 | 63 | 177 |
| "Electro Zinc" .. .. | 57 | 69 | 194 |
| Bunticide .. .. | 58 | 71 | 232 |
| Sickle .. .. .. | 51 | 62 | 243 |
| Vitrioline .. .. | 51 | 55 | 311 |

* The "anhydrous" copper sulphate of 1930 still had one molecule of water = $CuSO_4.H_2O$.

Tests were conducted at Rutherglen and Werribee in 1926 with 64 drill-sown rows, and a summary of the relative amounts of smut that appeared in these rows is given in Table XVIII., the amount of smut appearing in the rows treated with undiluted powder being regarded as 100.

TABLE XVIII.—COMPARISON OF DILUTED POWDERS, 1926.

*Federation seed smutted* 1-250. *Powder amounts* ½, 1, 1½, *and* 2 *ozs.*

| Strength of Powder. | Werribee. | Rutherglen. |
|---|---|---|
| | Amount of Smut. | Amount of Smut. |
| Cop. carb., 100% .. .. | 100 | 100 |
| ,, 75% .. .. | 153 | 127 |
| ,, 50% .. .. | 269 | 221 |
| ,, 25% .. .. | 382 | 295 |

Similar results to the above were obtained from a section comprising 192 hand-sown rows at Longerenong in 1927. These figures, shown in Table XIX., give the percentage of smut appearing in the rows and show that there is a progressive decrease in efficiency as the copper content is lowered.

TABLE XIX.—COMPARISON OF DILUTED POWDERS, LONGERENONG, 1927.

*Counts of smutted plants. Dollar seed smutted* 1-1,000.

| Strength of Powder. | 2 oz. per bushel. Mean Amount Smut. | 1½ oz. per bushel. Mean Amount Smut. | 1 oz. per bushel. Mean Amount Smut. | ½ oz. per bushel. Mean Amount Smut. |
|---|---|---|---|---|
| | % | % | % | % |
| Cop. carb., 100% | ·2 | ·58 | ·65 | 1·2 |
| ,, 75% | ·2 | ·4 | ·4 | 1·5 |
| ,, 50% | ·22 | ·2 | ·82 | 2·75 |
| ,, 25% | 1·2 | ·82 | 2·5 | 7·55 |

*Dollar seed smutted* 1-250.

| Strength of Powder. | 2 oz. per bushel. Mean Amount Smut. | 1½ oz. per bushel. Mean Amount Smut. | 1 oz. per bushel. Mean Amount Smut. | ½ oz. per bushel. Mean Amount Smut. |
|---|---|---|---|---|
| Cop. carb., 100% | 1·4 | 1·37 | 2·7 | 4·2 |
| ,, 75% | 2·4 | 2·05 | 4·82 | 6·1 |
| ,, 50% | 2·6 | 4·77 | 7·0 | 9·4 |
| ,, 25% | 4·8 | 7·4 | 11·9 | 27·5 |

*Dollar seed smutted* 1-100.

| Strength of Powder. | 2 oz. per bushel. Mean Amount Smut. | 1½ oz. per bushel. Mean Amount Smut. | 1 oz. per bushel. Mean Amount Smut. | ½ oz. per bushel. Mean Amount Smut. |
|---|---|---|---|---|
| | % | % | % | % |
| Cop. carb., 100% | 5·25 | 6·8 | 11·5 | 25·7 |
| ,, 75% | 14·5 | 9·3 | 17·6 | 32·5 |
| ,, 50% | 13·8 | 10·6 | 22·2 | 39·1 |
| ,, 25% | 16·1 | 14·8 | 38·3 | 64·5 |

Drill plots were substituted for hand rows at Longerenong in 1928. These plots were 5 hoes wide, and 50 feet long, and each alternate plot was a check plot of seed treated with undiluted powder equal to 100 per cent. copper carbonate. The results are shown in Table XX.

TABLE XX.—COMPARISON OF DILUTED POWDERS, LONGERENONG, 1928.

(*Figures showing percentage of smut in plots.*)

| Strength of Powder. | 2 oz. per Bushel. | 1 oz. per Bushel. | | ½ oz. per Bushel. | |
|---|---|---|---|---|---|
| | Mean of Plots A and B. | Plot A. | Plot B. | Plot A. | Plot B. |
| | % Smut. | % Smut. | % Smut. | % Smut. | % Smut. |
| 100% cop. carb... | 1·26 | 6·5 | 6·2 | 15·7 | 16·1 |
| Cop. carb., 75%.. | 1·5 | 14·8 | 13·8 | 16·8 | 16·5 |
| 100% cop. carb... | 1·4 | 5·8 | 9·6 | 16·6 | 18·9 |
| Cop. carb., 50%.. | 3·5 | 14·9 | 24·1 | 25·2 | 28·8 |
| 100% cop. carb... | ·5 | 6·1 | 8·0 | 21·6 | 23·1 |
| Cop. carb., 37%.. | 5·0 | 14·5 | 21·0 | 39·9 | 37·6 |
| 100% cop. carb... | 1·4 | 7·55 | 5·7 | 24·1 | 21·4 |
| Cop. carb., 25%.. | 9·6 | 30·4 | 29·2 | 40·0 | 40·0 |
| 100% cop. carb... | 1·15 | 4·9 | 8·5 | 28·4 | 25·4 |

These tests were designed to compare the relative efficiency of diluted and undiluted powders, and whilst they show a reduction of efficiency with the increasing proportion of diluent, they do not give a complete measure of the value of this diluent as a dispersing agent.

The reduction in bunticidal efficiency is not quite proportional to the amount of diluent present, and it seems that under certain conditions the diluent does have some value as a spreading agent. As might be expected, this is most noticeable when the amount of copper applied is small. With a normal dressing of powder (1½-2 oz.), there is sufficient dust present to coat and protect each grain, and there is nothing to be gained by increasing the bulk of this copper powder with an inert diluent. But with very small amounts of powder the uniformity of its distribution will determine largely the extent of infection. Where this small quantity is diluted with a much greater bulk of an inert powder the distribution will be made more uniform and should result in a better control of the smut.

An examination of the above results shows that this has actually occurred, and the increased bulk does seem to have increased the value of the small quantities of copper powder.

But this cannot be taken as supporting the desirability of using low-grade powders. If the quantity of powder applied is in excess of 1½ oz. per bushel the dust nuisance begins to be troublesome. Further, this quantity of a diluted powder would be insufficient for

heavily infected seed, and it would be difficult to cause any greater quantity of powder to adhere to the grain.

Most of the machines in use at present are capable of spreading 1 oz. of powder per bushel over the seed very uniformly, and little improvement could be made in this distribution by the addition of a spreader. Most satisfactory results will be obtained by the use of only high-grade copper powders, and these will afford a good margin of safety with little inconvenience from dust.

### Fineness of Powders.

For a powder to be an efficient bunticide it is essential that its physical as well as chemical condition shall be satisfactory. The powder must be dry and free, with no tendency towards caking, and it should be sufficiently fine to adhere readily to the grain. The extent to which this fineness of subdivision must be carried to ensure most effective pickling can be determined only by actual tests under field conditions. The failure of certain commercial powders under test could be attributed directly to their relatively coarse texture. Chemically they appeared satisfactory, their dispersion gave no indication of dampness, and they passed through a 200 mesh per inch sieve with ease, yet they gave poor results.

Up to the present, reports on the examination of copper powders have usually taken as a measure of fineness the proportion of the powder capable of passing through a 200 mesh sieve. But the size of most of the particles in the ordinary pickling powders is very much smaller than the openings in such a sieve, and figures relating to the fineness of a powder as measured in this manner are of little value. Only coarse foreign material and relatively very large particles are retained by this sieve. In order to determine what influence fineness had on smut control, it was decided to conduct experiments with powders of varying degrees of fineness.

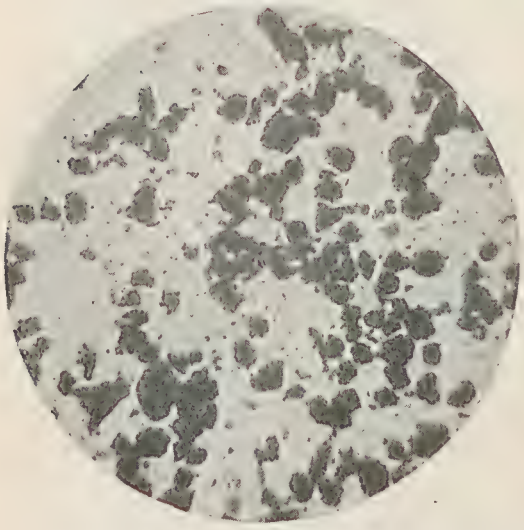
Table XXI.—Showing Size of Particles and Chemical Composition of Graded Fractions.

| Powder. | Approximate Particle Diameter, mms. | | Percentage of Copper. | $CO_2$. | $SO_3$. |
|---|---|---|---|---|---|
| | Mean. | Range. | | | |
| Original Powder | Variable | | 52·0 | 15·0 | 6·5 |
| Grade 6 (fine).. | ·0025 | ·001–·005 | 52·7 | 11·8 | 6·8 |
| Grade 5 .. | ·004 | ·002–·008 | 51·2 | 15·0 | 6·2 |
| Grade 4 .. | ·01 | ·007–·02 | 51·4 | 16·1 | 5·2 |
| Grade 3 .. | ·02 | ·01 –·03 | 45·3 | 15·2 | 6·4 |
| Grade 2 .. | ·03 | ·017–·05 | 49·8 | 14·4 | 6·5 |
| Grade 1 (coarse) | ·05 | ·03 –·08 | 49·8 | 15·4 | 6·8 |

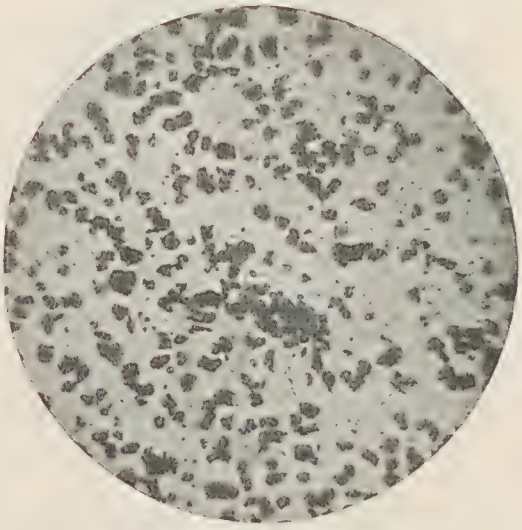
It was hoped that it would be possible to select from the commercial powders a range of dusts varying only in particle size, but it was soon found that these powders did not contain particles of uniform size, and that

Table XXII.—Percentage of Infected Plants in Powder Fineness Tests, Longerenong, 1928.

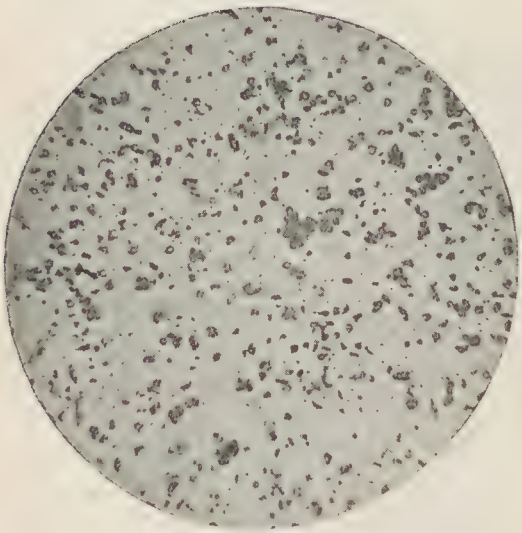
| Powder. | ½ oz. per Bushel. | | Calculated Bunticidal Value of Powder. | 1 oz. per Bushel. | | Calculated Bunticidal Value of Powder. | 2 oz. per bushel. | | Calculated Bunticidal Value of Powder. |
|---|---|---|---|---|---|---|---|---|---|
| | Plot A. % Smut. | Plot B. % Smut. | | Plot A. % Smut. | Plot B. % Smut. | | Plot A. % Smut. | Plot B. % Smut. | |
| Original Powder .. | 11·3 | 11·3 | 100 | 5·7 | 3·8 | 100 | 1·01 | 1·77 | 100 |
| Grade 6 .. .. | 11·5 | 11·0 | 106 | 2·2 | 2·6 | 150 | ·35 | ·71 | 125 |
| Original Powder .. | 13·2 | 12·5 | .. | 3·8 | 4·2 | .. | 1·32 | ·78 | .. |
| Grade 5 .. .. | 9·2 | 8·7 | 140 | 3·3 | 3·9 | 116 | 0 | ·56 | 125 |
| Original Powder .. | 12·7 | 11·7 | .. | 5·7 | 3·8 | .. | ·22 | ·60 | .. |
| Grade 4 .. .. | 12·5 | 16·9 | 76 | 8·2 | 6·1 | 75 | 4·4 | 1·8 | 65 |
| Original Powder .. | 11·7 | 10·6 | .. | 4·9 | 4·3 | .. | 2·2 | 1·37 | .. |
| Grade 3 .. .. | 15·5 | 13·4 | 80 | 5·2 | 5·8 | 88 | ·86 | 1·5 | 110 |
| Original Powder .. | 14·8 | 1·2 | .. | 4·2 | 4·0 | .. | 2·2 | 1·23 | .. |
| Grade 2 .. .. | 15·9 | 13·0 | 96 | 5·9 | 6·5 | 93 | 3·2 | 2·16 | 82 |
| Original Powder .. | 16·2 | 12·8 | .. | 7·3 | 5·5 | .. | 1·7 | 1·22 | .. |
| Grade 1 .. .. | 21·1 | 16·6 | 70 | 11·7 | 10·0 | 68 | 5·3 | 3·17 | 55 |
| Original Powder .. | 14·3 | 13·1 | .. | 6·4 | 5·1 | .. | ·86 | ·91 | .. |



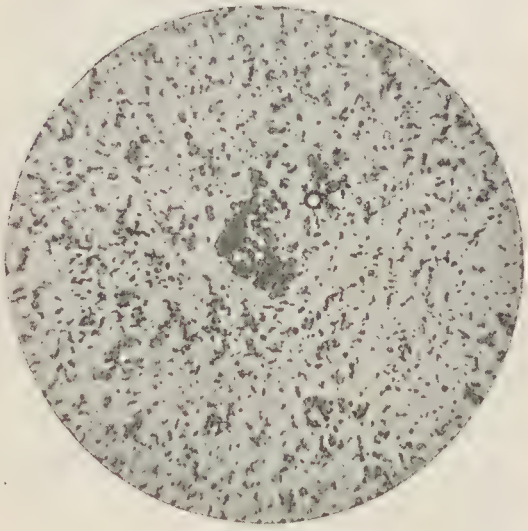
Grade 1.



Grade 2.



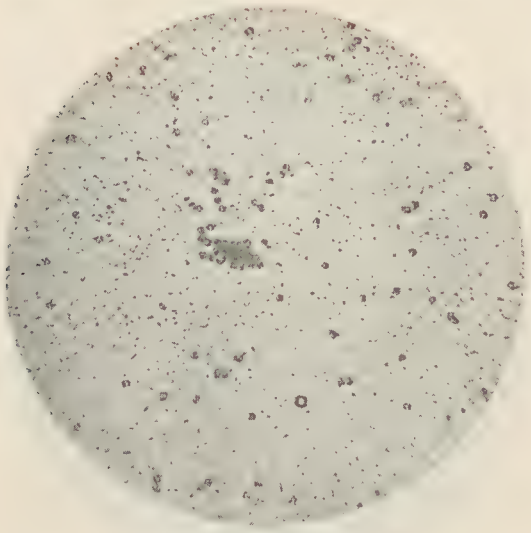
Grade 3.



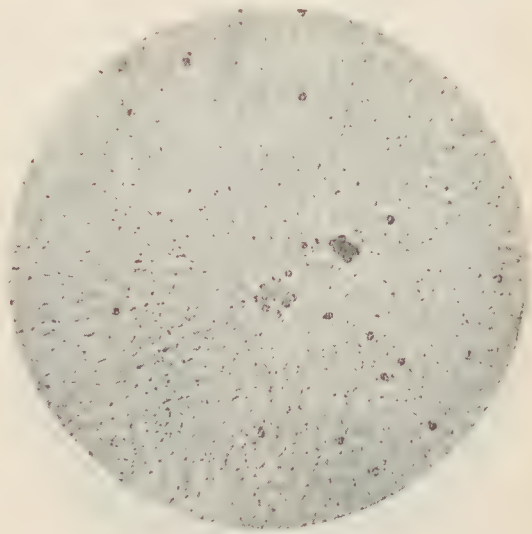
Grade 4.

**Photo-micrographs of the Graded Powders.**

*The accompanying illustrations are photo-micrographs of the six powders graded according to particle size. In order to give a comparison of the relative fineness of the powders, smut spores have been included, and a small group of these is shown near the centre of each photograph. Magnification, approx. 75 diameters.*



Grade 5.



Grade 6.

**Photo-micrographs of the Graded Powders.**

*The photograph of grade 6 shows that some flocculation has occurred with these very fine particles.*

they varied greatly in their chemical composition. It was thought possible that very fine sieves might enable some grading to be done, but a cursory examination of the powders showed that the particles were too small to be graded in this manner. To obtain the required range of powders, it was found necessary to take one commercial powder of suitable chemical composition and to grade it into fractions according to particle size, each fraction containing particles of a relatively uniform size. This was done in an apparatus designed on the principle of air elutriation. Six grades of powder were obtained in this manner, and Table XXI. shows their approximate particle size and chemical composition.

In order to determine the relative efficiency of these fractions for smut control the powders were tested under ordinary field conditions at Longerenong in 1928, and the results obtained are shown in Table XXII.

The experiment was conducted with plots 5 hoes wide and 50 feet long, using Dollar seed smutted 1-500, and the estimate of smut was made by count of sample bundles. Each alternate plot was a check plot sown with seed pickled with the original ungraded powder.

From the figures in Table XXII. it has been calculated that the various grades possess bunticidal values as follows:—

| Powder. | Mean Bunticidal Value. |
|---|---|
| Grade 6 (fine) .. .. .. | 127 |
| Grade 5 .. .. .. .. | 127 |
| Original Powder .. .. .. | 100 |
| Grade 4 .. .. .. .. | 72 |
| Grade 3 .. .. .. .. | 92·7 |
| Grade 2 .. .. .. .. | 90·3 |
| Grade 1 (coarse) .. .. .. | 64·3 |

From these results it can be seen that the finer grades of powder were much more effective in controlling infection than were the coarser ones, but it must be admitted that Grades 2 and 3 gave better results than might have been expected.

In an attempt to confirm these results, further experiments on the question of fineness were conducted in 1930. For these tests another powder was sorted out into the six grades similar to those obtained for the 1928 experiment. In 1930 the powder was applied at the rate of 1 oz. per bushel only, and the plots were repeated eight times, alternate plots again being used as checks. Estimation of infection was made by means of a count of total number of infected plants per plot. (See previous section of this report in April *Journal*.) Table XXIII. shows the amounts of smut appearing in these plots.

TABLE XXIII.—PERCENTAGE OF INFECTED PLANTS IN POWDER FINENESS TESTS, LONGERENONG, 1930.

*Sown with Dollar seed, smutted* 1-500. *Powder dosage,* 1 *oz. per bushel.*

| Powder. | Section A. | Section B. | Section C. | Section D. | Section E. | Section F. | Section G. | Section H. |
|---|---|---|---|---|---|---|---|---|
| | % Smut. | % Smut. | % Smut. | % Smut. | % Smut. | % Smut. | % Smut. | % Smut. |
| Check Original Powder .. .. | 4·13 | 5·22 | 5·86 | 4·56 | 5·0 | 6·74 | 5·0 | 6·52 |
| Grade 6 (fine) .. .. .. | 1·74 | 2·52 | 2·17 | 1·65 | 1·39 | 2·0 | 2·17 | 1·31 |
| Check Original Powder .. .. | 4·26 | 5·38 | 4·0 | 4·0 | 3·91 | 4·61 | 4·26 | 3·91 |
| Grade 5 .. .. .. .. | 2·26 | 3·04 | 2·17 | 2·61 | 2·26 | 2·87 | 3·04 | 2·26 |
| Check Original Powder .. .. | 4·08 | 4·52 | 4·43 | 4·96 | 4·52 | 5·48 | 4·69 | 3·74 |
| Grade 4 .. .. .. .. | 6·78 | 5·65 | 6·69 | 5·13 | 7·04 | 5·38 | 6·0 | 6·26 |
| Check Original Powder .. .. | 5·65 | 3·91 | 3·91 | 4·78 | 4·61 | 4·78 | 4·08 | 3·48 |
| Grade 3 .. .. .. .. | 6·52 | 5·13 | 5·83 | 6·86 | 5·73 | 6·61 | 6·34 | 5·74 |
| Check Original Powder .. .. | 5·22 | 4·35 | 5·13 | 6·52 | 6·35 | 5·73 | 6·95 | 5·13 |
| Grade 2 .. .. .. .. | 8·43 | 8·47 | 9·82 | 9·72 | 9·12 | 10·52 | 10·87 | 8·35 |
| Check Original Powder .. .. | 3·30 | 4·69 | 5·38 | 5·65 | 5·22 | 5·56 | 7·04 | 4·96 |
| Grade 1 (coarse) .. .. .. | 10·08 | 10·18 | 14·8 | 13·13 | 12·7 | 12·5 | 13·13 | 13·3 |
| Check Original Powder .. .. | 3·82 | 4·69 | 7·83 | 6·78 | 5·48 | 7·48 | 6·78 | 6·61 |

From Table XXIII. the following summary (Table XXIV.) has been prepared. In this is shown the relative amounts of smut appearing in each plot, the mean of the adjoining check plots being regarded as "100" in each case.

Owing to the fact that there were no "½ oz." or "2 oz." per bushel plots present with which to make comparisons, it was not possible to compute from these amounts of smut any definite "Bunticidal value" for the grades, as was done for the 1928 plots. But an examination of the figures shows that there is a big difference in the efficiency of the coarse and fine grades, the plots treated with the fine grade containing only one-sixth of the amount of smut shown by those treated with the coarsest grade.

In view of the fact that with the above graded powder only the largest particles of the coarsest grade were retained by a 200 mesh per inch sieve, it will be readily appreciated that this sieve gives a very inadequate measure of the fineness of an ordinary dry pickling powder. Indeed, as applied to these powders, this sieve merely serves to measure the amount of extremely coarse material present, and gives no indication of the degree of fineness of the material passing through the sieve. Examination of Table XXIV. shows that of the material which easily passes the 200 mesh sieve test, the coarsest fraction has produced almost four and a half times as much smut as has the finest fraction. Thus this sieve not only fails to give a measure of fineness, but also gives no indication of the probable efficiency of the powder.

Workers on the fineness of grinding of cement evidently have come to the same conclusion regarding the 200 mesh sieve, and they state that for the cement to be satisfactory not only shall 75 per cent. of it pass through

TABLE XXIV.—RELATIVE NUMBERS OF INFECTED PLANTS IN POWDER FINENESS TEST PLOTS.

| Powder. | A. | B. | C. | D. | E. | F. | G. | H. | Mean Relative Infection. |
|---|---|---|---|---|---|---|---|---|---|
| | Amount Smut. | Amount Smut. | Amount Smut. | Amount Smut. | Amount Smut. | Amount Smut. | Amount Smut. | Amount Smut. | |
| Grade 6 (fine) .. .. | 41·5 | 47·5 | 44·1 | 38·5 | 31·1 | 35·2 | 47 | 25 | 38·7 |
| Grade 5 .. .. .. | 54·2 | 61·4 | 51·5 | 58·2 | 53·5 | 56·9 | 68 | 59 | 57·8 |
| Grade 4 .. .. .. | 139 | 134 | 160 | 105 | 154 | 105 | 137 | 173 | 138·2 |
| Grade 3 .. .. .. | 120 | 124 | 129 | 121 | 105 | 126 | 115 | 133 | 121·6 |
| Grade 2 .. .. .. | 198 | 165 | 187 | 160 | 158 | 186 | 156 | 165 | 171·9 |
| Grade 1 (coarse) .. .. | 283 | 226 | 224 | 211 | 237 | 192 | 190 | 230 | 224·1 |
| Original Powder .. .. | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

the 200 sieve, but it must also include 40 to 50 per cent. in the form of "flour."

Hoffman in a recent work on the examination of dusts used for testing air cleaner efficiency records a similar experience with fine sieves. He found that these dusts could not be satisfactorily compared even when using sieves as fine as 325 meshes per inch, and that it was necessary to adopt methods of air flotation and settling.

A serious difficulty that occurs in the examination of these very fine dusts is their pronounced tendency to flocculate in air. Continued agitation of this fine material results in the formation of a number of small balls. In this condition we have large numbers of fine particles collecting together in a mass and behaving as a single larger particle. This tendency was very marked in Grade 6 and to a lesser degree in Grade 5, but evidently the other grades were not sufficiently fine to exhibit this phenomenon. Most of the commercial powders examined tended to flocculate more or less, and one, copper oxychloride, flocculated so persistently as to make its sorting into grades almost impossible. A careful examination of this powder showed that it was of extreme fineness and that it contained little or no coarse material.

Although these fine particles tend to flocculate in air, the tendency is much more pronounced in water and in most other suspension liquids. If suspension tests as an indication of fineness are attempted in this manner, the fine powders flocculate and settle as quickly as the coarse ones.

It was found that this tendency could be largely overcome by suspending the material in an 80 per cent. glycerine solution, and this medium was found to be very suitable for making temporary mounts of the powders for microscopical examination. The accompanying photographs illustrating the fineness of particles in the various grades were obtained from such temporary mounts. It will be seen from the photograph of Grade 6 that there is a tendency towards flocculation as well as a general drift of some of the material.

### Relation between Particle Size and the Apparent Density of a Powder.

The successful use of copper carbonate for dry pickling the first recorded by Darnell Smith[3] in 1915, but the adoption of the method was at first hampered by the scarcity and variability of this material. It was not until 1923 that Mackie and Briggs[14] issued in a bulletin of the University of California recommendations covering the features desirable in a copper carbonate for dry pickling purposes. They suggested that, as well as complying with certain chemical requirements, the "copper carbonate should not be of greater density than 32 pounds per cubic foot when shaken down in a graduated tube," and that as a measure of fineness, "not less than 99 per cent. of the copper carbonate dust in aqueous suspension should pass through a 200 mesh sieve."

Since then, it has become evident that the 200 mesh sieve test for fineness of these powders fails owing to the extreme fineness of particles in an efficient powder, and it now appears that the apparent density is the most hopeful means of obtaining a rough measure of the particle size of a powder.

Unfortunately the position has been further complicated by the fact that many copper compounds other than basic copper carbonate have been successfully used for dry pickling, and we find in this State that basic sulphate, acetate and oxychloride are also being used extensively for the purpose. Another serious drawback to the use of the apparent specific gravity as a comparative measure of powder fineness, is that at present there is no standard method of determining this figure, and it may vary over a wide range according to the amount of shaking and settling. Despite these difficulties, the apparent density of a powder still appears to give a very useful indication of its fineness and probable efficiency, provided, of course, that the powder has not been adulterated, which fact could be determined by chemical tests.

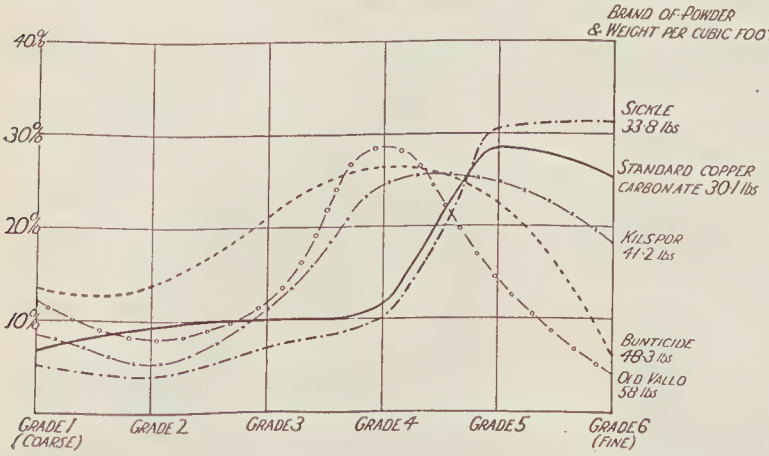
At the time that the apparatus was set up to sort out the various grades of powder, advantage was taken of the opportunity to determine the relative proportions of the various fractions present in some of the commercial powders. Fortunately the apparatus lent itself well to quantitative measurements, and the amount of each fraction obtained could be determined with reasonable accuracy. Repeated tests on the same material showed only small variations in the amounts of the respective fractions obtained each time. Table XXV. shows typical results obtained when sorting out triplicate samples of various powders.

TABLE XXV.—SHOWING UNIFORMITY OF RESULTS FROM GRADING APPARATUS.

| Powder. | Grade 1 | Grade 2 | Grade 3 | Grade 4 | Grade 5 | Grade 6 |
|---|---|---|---|---|---|---|
| | Amount obtained. | Amount obtained. | Amount obtained. | Amount obtained. | Amount obtained. | Amount obtained. |
| | % | % | % | % | % | % |
| Stan. Cop. Carb. 1 .. | 6·0 | 10·0 | 12·0 | 10·3 | 28·2 | 26·3 |
| Stan. Cop. Carb. 2 .. | 7·1 | 8·8 | 9·3 | 12·2 | 29·6 | 24·8 |
| Stan. Cop. Carb. 3 .. | 7·0 | 7·7 | 12·0 | 10·7 | 32·5 | 24·7 |
| Kilspor 1 .. | 9·3 | 6·6 | 9·7 | 21·0 | 22·7 | 18·0 |
| „ 2 .. | 8·7 | 5·3 | 11·7 | 26·7 | 20·0 | 19·3 |
| „ 3 .. | 8·0 | 6·0 | 12·0 | 23·0 | 25·0 | 19·0 |
| Bunticide 1 | 12·3 | 16·3 | 21·0 | 22·3 | 12·0 | 4·0 |
| „ 2 | 11·3 | 14·0 | 19·7 | 28·3 | 11·7 | 4·0 |
| „ 3 | 14·7 | 10·3 | 22·0 | 25·0 | 13·3 | 7·3 |

Having determined the relative amounts of the various fractions contained in a number of the commercial powders, an attempt was made to see if these figures bore any relation to the apparent density of the powder. It was found that, by adopting uniform methods, the apparent density could be determined within narrow limits, usually not exceeding .5 lb. per cubic foot for each powder.

Of the powders examined, it was found invariably that those with the lowest apparent density contained the greatest proportion of the finer fractions and vice versa. The accompanying graph giving the percentages of the fractions obtained from powders of varying apparent density shows this point clearly.




**Graph showing the Approximate Relative Amounts of Graded Fractions contained in various Copper Powders.**

In order to test this matter further, sufficient of the material, as used in the 1930 powder fineness tests, was sorted out to enable apparent density tests to be made on small quantities of the different fractions. With this material it was possible to make tests on powders of almost identical chemical composition and varying only in particle size. The results obtained gave indications similar to those recorded above, and it would appear that there is a very definite relation between particle size and the apparent density of a powder.

TABLE XXVI.—APPARENT DENSITY OF DIFFERENT GRADES OF POWDER.

| Powder. | Approximate Mean Particle Size. | Apparent Density. | |
|---|---|---|---|
| | | Grams per cu. cm. | Weight per cu. foot. |
| | mms. | | lb. |
| Original powder .. | Variable | ·93 | 58 |
| Grade 1 (coarse) .. | ·05 | 1·28 | 80·0 |
| Grade 2 .. | ·03 | 1·18 | 73·7 |
| Grade 3 .. | ·017 | 1·03 | 64·4 |
| Grade 4 .. | ·008 | ·87 | 54·3 |
| Grade 5 .. | ·004 | ·68 | 42·5 |
| Grade 6 (fine) .. | ·0025 | ·59 | 36·8 |

It will be seen from Table XXVI. that with the increasing fineness of the particles there has been a steady decrease in the apparent density, the apparent density of the coarsest fraction being more than twice as great as that of the finest. It might have been expected that the finest grade of this powder would have shown a lower apparent density than 36.8 lb. per cubic foot, but it will be noted that the density of the original ungraded powder was rather high, and in considering these figures it must be remembered that the apparent density is probably influenced considerably by the chemical composition of the powder.

A general survey of the results obtained by grading tests for fineness made on commercial powders showed that, with the copper powders examined, the apparent density gave an excellent practical measure of the fineness of particles irrespective of the actual

copper compound, providing, of course, that no adulteration had been practised.

## Summary.

This second article deals with the results of tests with the actual dry-pickling powders.

It was found that the smut infection varied greatly according to the rate of spore dosage on the seed, the quantity of powder applied, and the actual soil conditions under which the seed was sown. It is not possible to specify a minimum quantity of powder that will give satisfactory control under all conditions.

Tests were made on 14 copper pickling powders, which showed much variation both in chemical and physical properties.

Tests with the various brands of commercial copper powders showed that there was a considerable difference in their ability to control smut, some being twice as effective as others. From the amounts of smut appearing in these plots in 1928 and 1929, values have been calculated for the bunticidal power of the different commercial powders.

Experiments conducted on the question of the addition of diluents to the dry copper compounds show that the dilution results in an almost proportional reduction in the bunticidal value of the mixture.

Tests made on powders graded according to particle size, which were obtained by means of an air flotation apparatus, showed that the finer grades of powder are much more effective than the coarser ones.

Owing to the extreme fineness of the dry-pickling powders, the "200 mesh sieve" test as applied to these powders gives a very inadequate measure of the size of the particles present. Of the material which passed through a 200 mesh sieve, it was found that the coarsest material produced four and a half times as much smut as the finest. The value of this sieve as a measure of fineness appeared to be very limited, and an examination of the various copper compounds indicated that a much more useful measure of their approximate fineness could be obtained from the apparent density of the powder.

**Acknowledgment.**—The writer desires to acknowledge his indebtedness to Mr. H. A. Mullett, Agricultural Superintendent, under whose guidance the work has been conducted. Thanks are due also to the Agricultural Chemist, Mr. W. R. Jewell, for the chemical determinations and valuable suggestions in connexion with the work on the fineness of powders. The authorities of the Longerenong College kindly made available facilities for the field testing of the treated seed without which few conclusions could have been reached.

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# Rose Diseases and Their Control

(Continued from page 212).

*By B. J. Grieve, M.Sc. (National Society's Research Scholar ; Fred Knight and Wyselaskie Scholar).*

## IX.—ROSE GRAFT DISEASE.

ROSE Graft disease has come into prominence only of recent years, it being described for the first time in the United States in 1919. It affects newly-budded roses, and under favorable conditions may cause considerable damage in glasshouses devoted to rose-growing. Stocks used in the graft vary in susceptibility, and in this connexion Manetti stocks are considered by Vogel[4] to be resistant to the disease. Scions grafted on to such stock, however, frequently succumb to the disease.

### History and Distribution.

Rose Graft disease first became serious in the United States in 1919, when it was described by Vogel[4]. It has been recorded in England[1], and is probably present on the Continent of Europe. It has not been recorded for any part of Australia.

### Symptoms.

A characteristic symptom of this disease is the occurrence of lesions on the scion at the union, and just above the union, which result in the sudden wilting and death of the young rose graft. These lesions appear first as water-soaked areas near the base of the scion, or where it joins the stock. At first these areas are light yellow in colour, but as the tissues are killed they become dark brown. As the sub-epidermal tissues die, the epidermis becomes loosened and changes from dark to light brown in colour. Pycnidia of the fungus develop in the light-brown areas. The leaves of the young shoots wilt and drop. The lesions usually encircle the stem within a few days, so that the death of the graft is sudden. In other cases, the lesion develops and extends up the scion as a narrow furrow without showing any tendency to girdle the stem. In such cases the graft will not die immediately, but may develop into a dwarfed, one-sided plant, which may live for several years.

**Fig. 13.—Rose Graft Disease** (*Coniothyrium Fuckelii* Sacc.)

A young grafted rose plant bearing graft canker along the side of the scion nearest the stock.

(After Waterman.)

### Etiology.

The organism causing Rose Graft disease was considered by Vogel[4] to be *Coniothyrium Rosarum* Cke. & Hke. He stated that it differed from *Coniothyrium Fuckelii* Sacc. in the size of the pycnidia and the spores. Waterman[5], who has recently made a study of the species of Coniothyrium affecting the rose, considers that Vogel[4] was unjustified in naming *Coniothyrium Rosarum* as the cause of the disease. She believes that the organism isolated by Vogel was really *Coniothyrium Fuckelii* Sacc., and gives the following reasons:—

1. The differences in size of the pycnidia of *C. Rosarum* and *C. Fuckelii*, as noted by Vogel, may be due to the fact that Vogel was comparing the multiloculate pycnidia of the one with the uniloculate

pycnidia of the other. Both species form uniloculate pycnidia first, and then complex pycnidia later, both types being somewhat the same in size for each species.

2. The spores of the Graft Canker fungus vary in size from 2.0–4 x 1.6—3.6$\mu$, while the spores of the Common Canker fungus range from 2 – 4.4 x 1.2-3 $\mu$, The spore measurements, respectively, cover the same range as those of Cooke and Harkness[2] for *C. Rosarum* (3$\mu$ x 3–4$\mu$), and of Massee[3] for *C. Fuckelii* (3–4$\mu$ x 2–3$\mu$), and, therefore, it is considered that the fungi causing Rose Graft disease, and Common Canker disease of roses are identical.

*Coniothyrium Fuckelii* Sacc. is accepted as the causative agent in Rose Graft disease.

### Morphology.

Pycnidia brown to black, globose, papillate, multiloculate type 300–375$\mu$ in diameter; uniloculate type, 180–200$\mu$ in diameter spores 2–4 x 1.6–3.6$\mu$.

### Life History.

Graft cankers appear to result from infection through wounds or through the callus at the point of union of stock and scion. Pycnidia are formed in the water-soaked cankerous areas. Pycnospores germinate under favorable conditions of temperature and moisture, and infect other plants.

### Control.

Once the disease appears in a plant it is impossible to control it, and affected plants must be burnt. Rose-budders should select buds from disease-free plants only, and then exercise care in the operation of budding. Vogel[4] suggests that attempts be made to grow resistant varieties. No further data are to hand concerning progress in this direction.

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## X.—CROWN CANKER OF ROSES.

Crown Canker disease affects only roses grown under glass, but is nevertheless an economically serious disease. According to Anderson[1] some varieties, for example Hoosier Beauty, are more susceptible than others, but there is yet no evidence that any are immune. Massey[3] has observed the disease on Hoosier Beauty, Ophelia, Hadley, Russell Sunburst, American Beauty, and on many seedlings.

### HISTORY AND DISTRIBUTION.

Crown Canker of roses was first described by Massey in 1917 in the United States. It was no doubt present in America long before this, but escaped notice largely on account of its obscure symptoms, and consequent difficulty of diagnosis. The disease in 1919 had been reported from northern and eastern United States, but it is probable that it has a much wider range. So far as is known, it has not been recorded outside America.

Massey[3] gave the name Crown Canker to the disease in 1916, while Anderson[1] in a detailed paper in 1919 refers to it as Rose Canker. Crown Canker is the most appropriate name, since it implies a difference from the other cankerous diseases of the rose.

### ECONOMIC IMPORTANCE.

As indicated above, this disease is found only on greenhouse-grown roses; and in the United States, where much greenhouse growing of roses is carried on, it causes great loss to growers. Massey[4] states that a decrease of about ten blossoms per plant per year occurs when plants are grown in infected soil. This means a loss to the grower of about 4s. 6d. per plant, and he may have hundreds of plants affected in his houses. Its seriousness is thus not measured by the number of plants killed, but rather by the decrease in blossoming power.

### Symptoms.

Diseased plants are most commonly affected at the crown, usually just at the surface of the soil, the lesions in advanced cases extending several inches above the soil. Any other part of the stem, however, may be affected. The young canker is blue black or purplish in colour and smooth, but as it becomes older the part above ground becomes red brown, dry, hard, and cracked longitudinally. The margin

is definite, and the dead area becomes sunken. Frequently the part of the stem immediately above the canker is swollen.

When the subterranean part of the canker becomes old, it is watersoaked and punky, and the bark may be rubbed off between the thumb and forefinger. Sometimes a callus is formed round the edge of the canker. Two types of cankers occur on the stem and on the branches higher up. The larger ones start from wounds, especially the stubs which are left after the blossoms are cut. Cankers from these stubs run back down the stems. Cankers may also start from other wounds besides cut stubs. They are usually oval in outline, and may be several inches long. The second type of aerial canker starts directly on the healthy green bark. First, small round purple areas appear, sometimes singly, but more often in groups. As these increase in size, the centres become light brown, and the margins remain dark, giving a "bird's-eye" effect.

**Fig. 14—Crown Canker of Roses (*Cylindrocladium scoparium* Morg.)** (After Anderson.)

The depth of the canker varies, but this disease is particularly[3] one of the bark, and the discoloured area is generally located outside the cambium.

It may go deeper, however, and then the whole shoot dies. Diagnosis in the case of this disease is rendered difficult in view of the fact that many varieties of roses turn black at the crown naturally, and the bark of all rose stems cracks with age, especially at the base.

### Etiology.

Morgan[5], in 1892, described a fungus growing on an old pod of Gleditschia, under the name of *Cylindrocladium scoparium* (Morg.). L. Massey[3], in 1917, described Crown Canker of roses, and proved it to be due to this fungus. Anderson[1], in 1919, substantiated this, and described a saprophytic fungus *Cylindrocladium parvum,* which he found in constant and close association with the other parasitic Cylindrocladium.

### Morphology.

Fertile hyphae erect, hyaline, septate, and di- or tri-chotomously branched.

Spores are cut off from the conidiophores by constriction. They are held together by a sticky substance forming a more or less cylindrical head. Spores are solitary, cylindric, one septate, hyaline, obtuse at each end, and appear to taper slightly from apex to base; 36–55$\mu$ long x 3–4.5$\mu$ broad. Vegetative hyphae septate, walls and contents colourless when young, becoming brownish with age. Hyphae are constricted at the septae, cells short and oval. They now contain large drops of reserve food material, and have thick walls, and are of the nature of chlamydospores. Sclerotia are formed on the surface of old cankers.

### Life History.

The life cycle begins with the germination of the spores. Each spore under favorable conditions puts out four germ tubes, and these grow and branch rapidly, forming a mycelium. The fungus may live saprophytically in the soil for years, without the rose being present, but when rose plants are present infection by means of spores may occur. Infection takes place either through abrasions on the stem through pruned surfaces or through breathing-pores on the stem. Spores are produced on the living rose plant, but they are produced much more abundantly on dead rose twigs in the soil. Sclerotia are also commonly formed on old cankers.

### Control.

Anderson[1] recommends the following control measures:—

1. Carefully inspect the rose-house to see if Crown Canker is present. If not, employ every means to prevent its entering. Import as few roses as possible from other houses. Carefully examine every plant brought in, and reject any with suspicious dead areas in the bark.
2. Dip cuttings in Bordeaux mixture.
3. Sterilize the pots by dipping for ten minutes in boiling water.
4. Sterilize the potting soil, and cutting bench soil by steaming to a temperature of over 50 deg. C. for ten minutes.
5. Use raised benches, not ground beds.
6. Remove old soil, if diseased roses have been grown in it, and soak the benches thoroughly with formaldehyde (1 pint to 25 gallons of water) or with boiling water.
7. Sterilize the bench soil, using the above method.
8. Sterilize tools before use.
9. Keep the walks in all houses covered with lime.

Massey[4], in experiments dealing with the addition of various chemicals to the soil, found that the addition of calcium sulphate ($CaSO_4$), ammonium sulphate ($NH_4SO_4$), potassium sulphate ($K_2SO_4$), calcium oxide (CaO), and acid phosphate, exerted no influence on the losses caused by the parasite.

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## XI.—CANE BLIGHT OF THE ROSE.

Cane Blight of the rose is a cankerous disease, occurring in the United States of America. The fungus causing the disease can attack currant bushes as well as roses, and thus the disease may be of considerable economic importance. In the United States, where it was described, it causes extensive losses in currant plantations, and is also serious on the rose.

### History and Distribution.

The fungus concerned was known to be parasitic on currant bushes in the United States in 1911, but it was only in 1922 that rose plants were found to be affected. The disease has not been reported on roses outside the United States, but it is interesting to note that it is found mainly on rose species from China, or their hybrids, e.g., *Rosa adenosephala, R. caudata, R.l'heritierana,* and *R. pratincola.*

### Symptoms.

The most conspicuous symptom of this disease is the wilting of the leaves of infected plants. The entire cane may not be blighted, and the lesions may remain as definite cankers on the stems. The small pimple-like fruiting

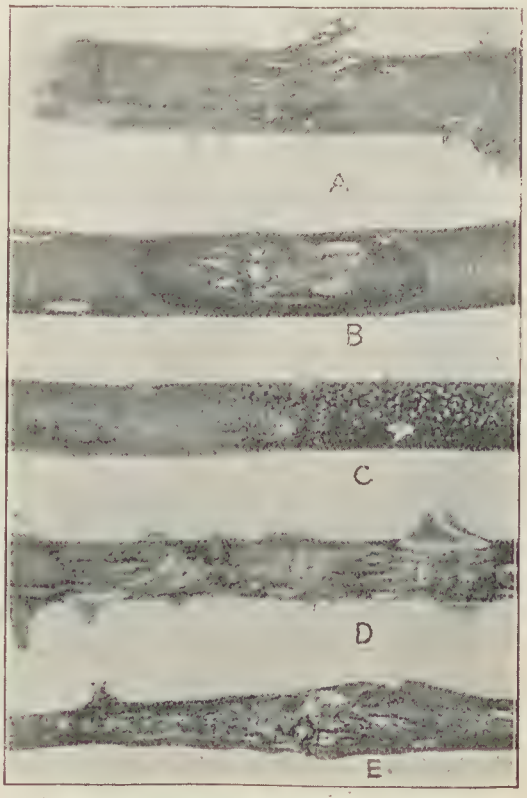


**Fig. 15.—Cane Blight of the Rose** (*Botryosphaeria ribis chromogena*).

A.B. Typical cankers due to the fungus.
C.D. Blighted canes showing fruiting bodies of the fungus scattered over the surface.
(After Stevens and Jenkins.)

bodies of the fungus are distributed over the surface of the cankered bark, which is of a characteristic seal-brown colour. Recently blighted canes, on the development of the fruiting structure of the fungus, become speckled, with slightly raised golden-brown dots. As the fungus develops, considerable areas may present this golden-brown colour, which with the natural sheen of the bark makes the cane appear as though gilded. These surfaces later become dull owing to the further development of the dark stroma underneath. The diseased canes may become so swollen that the bark is roughened and split longitudinally. Infection is believed to occur through a bud or a young shoot.

### Etiology.

Cane Blight is caused by the fungus *Botryosphaeria ribis chromogena* Gr. & D. This fungus was first found parasitic on currant bushes by Grossenbacher and Duggar[1] (1907-1911), and was named as above. Stevens and Jenkins[2], in 1924, showed it to be parasitic on rose plants as well. In the case of this disease isolation of the pathogen is necessary, in order to be sure which cankerous disease one is dealing with.

### Morphology.

Stromata 1–4mm. in diameter; perithecia 175–250$\mu$ wide; asci 80–120$\mu$ x 17–20$\mu$; ascospores 16–23 x 5–7$\mu$.

Pycnidia, equal in size to the perithecia, also occur, pycnospores 16–31$\mu$ x 4.5–8$\mu$.

### Control.

1. Prune out and burn all affected parts.
2. Spray with Bordeaux mixture.
3. Do not plant roses in the vicinity of currant bushes or horse-chestnut trees, if these are known to be infected.

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## Tick Beans

[*Continued from page* 223.

is found in the use of green crops in conjunction with inorganic artificial fertilizers.

Such a green crop as the illustration shows would supply with the haulms and roots about 3 tons of dry organic matter per acre to the soil. Five per cent. of this dry matter would be taken from the soil, the other 95 per cent. would be taken from the atmosphere—this is the part which forms the humus. It will be seen from this that although the crop is returned to the soil from which it grows, it adds a far greater amount of material than it extracts from it.

Many other plants are grown for green manure crops, and often meet with indifferent success. Mixtures of a legume and some cereal such as barley are sometimes grown, the object being for the cereal to supply a great deal of the organic matter and the legume to supply the rest of the organic matter and all the nitrogen. Growers who have not met with the success they desire in the growing of green crops are recommended to try tick beans, as they appear to do well under varying conditions.

## Unprofitable Fruit Trees

[*Continued from page* 232.

The "duds," provided they are healthy, can be replaced at little trouble and cost by reworking better types and varieties. The change over can be a gradual process, that is, a number can be re-worked each year over a period of from three to five years. Details of reworking are given in a Departmental Bulletin on "Budding, Grafting, and Inarching of Fruit Trees," obtainable from the Department of Agriculture at a cost of 5d. (including postage). As this Bulletin is well illustrated, it enables the beginner to become quickly acquainted with the details of budding, grafting, and re-working of trees.

To those growers who desire to re-work apple trees over to other varieties, I would emphasise strongly the necessity for cutting back as little as possible of the main arms of the trees. (*See* Figs. 2, 3, 4, and 5.) This hard cutting back has proved fatal to thousands of apple trees, due to the fungus Polystictus attacking and doing great harm to the tree when cut hard back. Details regarding this are contained in the Bulletin referred to above.

# Registration of Stallions

## Eleventh Annual Report

*(Horse Breeding Act 1928.)*

*By E. A. Kendall, B.V.Sc., Chief Veterinary Inspector.*

DURING the year 1930-31 there were 757 stallions registered under the *Horse Breeding Act* 1928, as against 787 for the previous year. Draught stallions, as usual, predominated, their number reaching 567, which exceeds last year's figures by 10. The number of registrations effected in the light classes was 105, or 29 less, and in the pony class 85, or 11 less than last year.

Of the 757 registrations effected, 504 were in respect of stallions which were not required to be submitted for examination by reason of their having been previously passed and registered at the ages of three, four, and five years. The remaining 253 were examined at the scheduled parades at various centres throughout the State. These comprised 213 draught, 26 light, and 14 pony stallions of the ages of five years and under.

In the draught class, of 213 stallions examined, 56, or 26.29 per cent., were rejected; 19, or 8.92 per cent., on account of unsoundness, and 37, or 17.37 per cent., as being below a reasonable standard for begetting utility horses. In the light class, of 26 examined, 3, or 11.53 per cent., were rejected; unsoundness accounting for 2, or 7.69 per cent. The third one was refused as being of low standard. Of the 14 pony stallions examined one was rejected for low standard.

A comparison of these figures with those for the year 1929-30, as shown in the tables set out in the report, shows that the total percentage of rejections is higher this year than last year, being 23.71 per cent. as against 21.52 per cent., which in turn was greater than the year 1928-29.

From this it would appear that the situation with regard to the suitability of the stallions standing for public service in Victoria is not improving. Indeed, so far as the standard is concerned, it has become progressively worse, as shown by the percentage of rejections on that ground for the last three seasons, viz., 9.28 per cent., 11.21 per cent., and 15.41 per cent. respectively.

This year's high figure is contributed to mainly by the draught class with its 17.37 per cent. of rejections for low standard. As this section of the utility horse-breeding industry far outweighs the other two in importance, it is clearly evident that more attention and care must be exercised by breeders in the selection of both mares and stallions if the object in view is to breed a colt fit to retain as a stallion. However good the sire may be as regards breed type and conformation, it is too much to expect him to beget anything approaching his like unless mated with a mare of similar standard.

It may be contended that the lighter draught utility sorts for farm, orchard, and industrial purposes are necessary, and even essential, in certain districts, and that lighter or half-bred mares are therefore the most suitable to breed to a draught stallion to beget them. Such a contention may well hold good. It will hardly be suggested, however, that the fundamental principles of stock-breeding and the accumulated experience of generations of noted and successful breeders should be cast aside entirely, and that a colt got in this way should be retained to reproduce his kind in preference to one of recognized and fixed type.

In contrast to the higher percentage of disapproved draught stallions, it will be noted that the rejections on the ground of unsoundness show a decided improvement, the figures for the year under review being 8.92 per cent.

as against 12.02 per cent. for 1929-30. As in previous years, the principal unsoundness is side-bone. This year's percentage, however, is still higher than for 1928-29, which stands at 5.47 per cent.

This fluctuation is disconcerting, and indicates that any permanency in the reduction of unsoundness has yet to be attained. Whether future years will show improvement in this direction is doubtful, by reason of the

### *Summary of Examinations, 1930-31.*

| — | Draught. | | Light. | | Pony. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | Examined. 213 | Certificated. 157 | Examined. 26 | Certificated. 23 | Examined. 14 | Certificated. 13 | Examined. 253 | Certificated. 193 |
| | Rejected. | Per cent. Rejected. | Rejected. | Per cent. Rejected. | Rejected. | Per cent. Rejected. | Rejected. | Per cent. Rejected. |
| Bog Spavin | 1 | ·47 | .. | .. | .. | .. | 1 | ·39 |
| Bone Spavin | .. | .. | 1 | 3·84 | .. | .. | 1 | ·39 |
| Cataract | .. | .. | .. | .. | .. | .. | .. | .. |
| Curb | .. | .. | .. | .. | .. | .. | .. | .. |
| Osteo Porosis | .. | .. | .. | .. | .. | .. | .. | .. |
| Ringbone | .. | .. | 1 | 3·84 | .. | .. | 1 | ·39 |
| Roaring | .. | .. | .. | .. | .. | .. | .. | .. |
| Shivering | .. | .. | .. | .. | .. | .. | .. | .. |
| Sidebone | 17 | 7·98 | .. | .. | .. | .. | 17 | 6·72 |
| Stringhalt | 1 | ·47 | .. | .. | .. | .. | 1 | ·39 |
| Through unsoundness | 19 | 8·92 | 2 | 7·69 | .. | .. | 21 | 8·30 |
| Through disapproval | 37 | 17·37 | 1 | 3·84 | 1 | 7·14 | 39 | 15·41 |
| Total | 56 | 26·29 | 3 | 11·53 | 1 | 7·14 | 60 | 23·71 |

### *Summary of Examinations, 1929-30.*

| — | Draught. | | Light. | | Pony. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | Examined. 183 | Certificated. 141 | Examined. 24 | Certificated. 20 | Examined. 16 | Certificated. 14 | Examined. 223 | Certificated. 175 |
| | Rejected. | Per cent. Rejected. | Rejected. | Per cent. Rejected. | Rejected. | Per cent. Rejected. | Rejected. | Per cent. Rejected. |
| Bog Spavin | .. | .. | .. | .. | .. | .. | .. | .. |
| Bone Spavin | .. | .. | .. | .. | .. | .. | .. | .. |
| Cataract | .. | .. | .. | .. | .. | .. | .. | .. |
| Curb | .. | .. | .. | .. | 1 | 6·25 | 1 | ·45 |
| Osteo Porosis | .. | .. | .. | .. | .. | .. | .. | .. |
| Ringbone | 2 | 1·09 | .. | .. | .. | .. | 2 | ·89 |
| Roaring | .. | .. | .. | .. | .. | .. | .. | .. |
| Shivering | .. | .. | .. | .. | .. | .. | .. | .. |
| Sidebone | 19 | 10·38 | .. | .. | .. | .. | 19 | 8·52 |
| Stringhalt | 1 | ·55 | .. | .. | .. | .. | 1 | ·45 |
| Through unsoundness | 22 | 12·02 | .. | .. | 1 | 6·25 | 23 | 10·31 |
| Through disapproval | 20 | 10·93 | 4 | 16·66 | 1 | 6·25 | 25 | 11·21 |
| Total | 42 | 22·95 | 4 | 16·66 | 2 | 12·50 | 48 | 21·52 |

fact that, as the law stands at present, rejected stallions may still do stud duty with the owner's own mares. There is, therefore, the possibility of unsound female progeny got in this way handing down the defect when used in their turn for breeding purposes even when mated with a sound sire.

In last year's report mention was made of the shortage of suitable stallions for breeding heavy horses, as shown by the drop in the number of young sires submitted for examination from 201 in 1928-29 to 183 in 1929-30, and the registrations of these from 175 to 141 respectively. This was attributed mainly to drought conditions which had prevailed for several years in certain parts of the State rendering the keeping and travelling of stallions therein unpayable.

This year the number of young stallions examined has risen to 213, an increase of 30 on last year's figures, whilst the number registered has expanded from 141 to 157, an increase of 16. Though the excess registrations, compared with last year, are not in keeping with the 30 additional young stallions submitted for examination, these increases may be regarded as indicative of a probable revival in the demand for heavy horses for both farm and industrial purposes. It will be, therefore, a matter of considerable interest to observe the results of the ensuing year's operations under the Horse Breeding Act. The present outlook appears more hopeful for the draught horse-breeding industry than for several years past.

Factors contributing largely to such a revival are undoubtedly the low prices ruling for wheat and other farm produce and the increasing cost of power farming. The economics of these operations have now assumed much greater importance than in the years of higher prices for produce. Most of those engaged in farming operations are very concerned as to how farming costs can be reduced to make their enterprise payable, and many are turning from tractors and looking in the direction of horses as at least one means to that end.

It has become to farmers a question not of what horses can do compared with tractors —for there has never really been any dispute as to the superiority of the tractor as a power —but which will do the work more cheaply and which is the better asset, particularly in periods like the present. This question must be decided by the farmer himself.

After having taken fully into consideration the extent of his farming operations, he should determine whether it is more economical for his purpose to incur the cost of a tractor, allowing for running costs, upkeep, and depreciation, or have a team of horses which could well include a few mares suitable for breeding, the progeny of which in due time can be used to replace wastage or sold for profit.

Before arriving at his decision in this matter, the farmer should also consider this question of economics of production in its national aspect as well as in its application to the working of his farm. It is certain that a more general return to the use of horses for farm operations and other purposes will result in the retention of a considerable amount of money in the State instead of its being sent overseas for the purchase of tractors, fuel, and oil. Benefit would also accrue to other local industries such as leather, harness, and farm implement manufacture, &c., besides the farmer himself finding a better market for crops grown for horse feed.

### *Appeals.*

There were five examinations conducted by the Appeal Board during the year on appeal against decisions of the veterinary officers. In four cases the appeals were upheld (two decisions as to disapproval on account of low standard and one each for bone spavin and side-bone). The other appeal, which was in respect of side-bone, was dismissed.

### *Compensation for Stallions Rejected.*

Five owners availed themselves of the compensation provisions of the Horse Breeding Act in respect of stallions which, having been registered for the preceding year, were refused registration on the grounds of unsoundness at this year's inspection, and subsequently castrated.

### *Parades for the Coming Season.*

As the winter railway time-table is not yet available, the publication of the schedule of stallion inspection parades is unavoidably held over till next month.

# Stallion Register 1930-31

*(Under the Horse Breeding Act 1928)*

**Part 1.—Registrations prior to the 1st September, 1930**

| Cert. No. | Name. | Age—Years. | Class. | Owner. | Address. |
|---|---|---|---|---|---|
| 413 | Allandale | A | Draught | S. A. Burdett | Hopetoun |
| 154 | Amyville Fashion | A | „ | J. Slavin | Homewood |
| 256 | Ardlaw Heir | 6 | „ | N. Ramsay | Newbridge |
| 222 | Ardmore | A | „ | Pollock Bros. | Derby |
| 343 | Argyle Favourite | 3 | „ | J. L. McErvale | Brewster |
| 441 | Attractions Champion | A | „ | W. Morley | Rutherglen |
| 27 | Avon Dale | A | „ | E. J. Fowler | Anakie |
| 129 | Avon Lea | A | „ | Jas. Leitch | Wodonga West |
| 367 | Balance Again | 3 | „ | J. L. Arthur | Wootong Vale |
| 443 | Bangaroo Honour | A | „ | C. A. Schulze, junr. | Jeparit |
| 268 | Bankers Pride | 3 | „ | R. Carroll | Bungally, W. Aust. |
| 98 | Barney | A | Pony | C. Cameron | Henty |
| 65 | Barney II. | A | „ | A. W. Thomson | Hamilton |
| 310 | Baron | A | Draught | J. Carroll | Mudgegonga |
| 54 | Baron Carlyle | A | „ | E. C. Gibbs | Kew |
| 414 | Baron Cedric | A | „ | G. Luckie | Springhurst |
| 299 | Baron Chief | A | „ | S. E. McIntyre | Condah |
| 415 | Baron Clover | A | „ | J. Lord | Boigbeat |
| 424 | Baron Clyde | 3 | „ | D. Chisholm | Swan Hill |
| 382 | Baron Crawford | A | „ | L. J. King | Quambatook |
| 355 | Baron Dale | 3 | „ | J. W. McDougall | Katandra |
| 131 | Baron Darnley | 5 | „ | G. E. McManus | Sea Lake |
| 33 | Baron Douglas | A | „ | T. Buckley | Romsey |
| 344 | Baron Footprint | 5 | „ | Jackson Bros. | Piree P.O. |
| 483 | Baron Jack | 5 | „ | Mrs. E. E. Pickering | Hopetoun |
| 156 | Baron Juno | A | „ | T. Wallbridge Pty. Ltd. | Melbourne |
| 283 | Baron Kerrston | 3 | „ | H. Doherty | Yundool |
| 501 | Baron King | 5 | „ | W. Watts | Kamarooka |
| 388 | Baron Lee | A | „ | J. Beechey | Terang |
| 333 | Baron Lee | A | „ | A. E. Albert | Willaura |
| 404 | Baron Loch | 5 | „ | W. Kempton and Son | Camperdown |
| 224 | Baron Major | A | „ | Krelle and Henke | Boolite |
| 309 | Baron May | A | „ | H. W. O'Berin | Goornong |
| 157 | Baron Nowfield | A | „ | W. Jardine | Rathscar |
| 416 | Baron Pettie | A | „ | J. Price | Mologa |
| 253 | Baron Prince | A | „ | R. P. Banke | Simmie P.O. |
| 177 | Baron Silk | A | „ | Ellwood Bros. | Wallace |
| 347 | Baron Walla | 3 | „ | P. Hamilton | Burrumbeet |
| 15 | Baron Weerite | A | „ | J. Manifold | Weerite |
| 158 | Baron Willie | A | „ | A. C. Morris | Numurkah |
| 20 | Baron's Best | 6 | „ | Mrs. M. Bartlett | Yarrock |
| 466 | Baron's Pride | A | „ | J. J. Quinn | Elmore |
| 178 | Baron's Royal Chief | A | „ | C. Appleby | Slaty Creek |
| 99 | Baron's Star | A | „ | F. Lehmann | Lismore |
| 411 | Baroona Boomerang | 6 | „ | A. Turnbull | Coleraine |
| 233 | Basella | A | Thoroughbred | R. O'Halloran | Granya |
| 436 | Beau Cavalier | 3 | Draught | J. C. Wallis | Kaniva |
| 134 | Beau Fils | A | Thoroughbred | Executor of the late W. E. Mitchell | Corryong |
| 383 | Belgian's Choice | 6 | Draught | F. R. Widdicombe | Digby |
| 380 | Belmain Belmont | A | „ | L. J. King | Quambatook |
| 370 | Belmont Again | 5 | „ | O. Jaeschke | Angip |
| 197 | Belmont Print | A | „ | J. M. Egan | Woodleigh |
| 384 | Belmont Stephen | 5 | „ | A. J. D. McRae | Gre Gre North |
| 327 | Ben Hamilton | 6 | „ | L. McKenzie | Nandaly |

STALLION REGISTER 1930–31—*continued.*

| Cert. No. | Name. | Age—Years. | Class. | Owner. | Address. |
|---|---|---|---|---|---|
| 58 | Ben Lomond | A | Draught | Sewell Bros. | Smeaton |
| 190 | Ben Model | A | „ | H. Adams | Yaapeet |
| 198 | Bingen | A | Light | A. Fullarton | Shepparton |
| 200 | Black Jack | 6 | Pony | R. W. Jukes | Maryborough |
| 485 | Black Prince | 3 | Draught | W. J. Ibbs | Gannawarra |
| 450 | Black Wasp | A | Pony | E. Wheelahan | Ballan |
| 199 | Blackadder | A | Thoroughbred | H. F. and F. W. Hoysted | Wangaratta |
| 21 | Blackthorn of Penniwells | A | Pony | Mrs. J. McLellan | Windsor |
| 159 | Blackwood | 6 | Light | P. Glasheen | Huntly |
| 350 | Blair's Laddie | 4 | Draught | F. E. Brown | Woomelang |
| 481 | Blair's Pride | 5 | „ | H. E. Poulton | Hopetoun West |
| 362 | Bloomfield Craig | 3 | „ | R. H. Larcombe | Mt. Rouse |
| 262 | Bobbie | A | Pony | E. Barratt | Traynor's Lagoon |
| 351 | Bob Craig | 5 | Draught | Dunstan Bros. | Jeffcott |
| 100 | Bobniak | A | Light | H. F. Clarke | Miepoll |
| 55 | Bobs | A | Draught | A. O. Allen | Murrayville |
| 133 | Bold Acton | A | „ | L. Culloden | Jung |
| 379 | Bold Alex | A | „ | L. J. King | Quambatook |
| 300 | Bold Arthur | A | „ | J. Galloway | Majorca |
| 401 | Bold Boy | A | „ | G. Oxley | Gre Gre North |
| 366 | Bold Briton | A | „ | Byron Bros. | Callawadda |
| 10 | Bold Captain | A | „ | C. B. Werner | Nhill |
| 160 | Bold Craig | A | „ | J. A. Collins | Fenton's Creek |
| 137 | Bold Douglas | A | „ | R. Stewart | Tolmie |
| 342 | Bold Milford | 3 | „ | Executor of late W. Pope | Donald |
| 398 | Bold Newton | A | „ | P. K. Tomkins | Casterton |
| 287 | Bold Record | 4 | „ | A. Dickins | Corowa |
| 282 | Bold Salute | 3 | „ | A. W. Watson | Nullawil |
| 67 | Bold Scott | A | „ | H. Oliver | Duchembegorra |
| 68 | Bold Squire | A | „ | G. E. Schmidt | Kellalac |
| 297 | Bold Wallace | 4 | „ | G. H. Richards | Gymbowen |
| 241 | Bonnie Brae | A | „ | H. Goldsmith | Corack |
| 266 | Bonnie Dignity | 3 | „ | D. N. McDonald | Miram |
| 10 | Bonnie Caesar | A | Light | C. P. Campbell | Glenorchy |
| 87 | Bonnie Salisbury | A | Draught | C. H. Feldtmann | Major Plains |
| 81 | Bonnie Star | 5 | „ | E. S. Gillespie | Rockbank |
| 135 | Bonny Mac | A | „ | D. Forbes | Glenthompson |
| 340 | Bon Wickliffe | A | Light | Jas. Ford | Wickliffe |
| 490 | Boondilla Viceroy | 5 | Draught | J. Dalrymple | Willenabrina |
| 396 | Boorongie Prince | 4 | „ | Shaddock and Sons | Ouyen |
| 301 | Boro Sportsman | A | „ | W. Gull | Kenmare |
| 360 | Boundary Park Favourite | 3 | „ | W. H. Ewart | Dargalong |
| 514 | Bright Star | 5 | „ | J. Walker | Corio |
| 161 | Bright Treasure | A | „ | M. Thompson | Yalca |
| 265 | Britannia | 4 | „ | C. S. Rodda | Warracknabeal |
| 444 | Briton's Fame | 6 | „ | C. A. Schulze | Hounsell's L.B. |
| 453 | Brogyntyn Handyman | A | „ | K. Cameron | Warracknabeal |
| 513 | Brown Alexander | 4 | „ | A. Thompson | Werribee |
| 162 | Brown Brilliant | A | „ | J. A. Cain | Boxwood |
| 201 | Buchlyvies Choice | A | „ | W. J. Westendorf | Dimboola |
| 225 | Burnealto | A | Light | C. Caldwell | White Hills |
| 226 | Burnside Baron | A | Draught | H. C. Younger | Greta |
| 242 | Bushlark | A | Light | W. H. Penaluna | Boolarra |
| 339 | Byrnwood's Pride | A | Draught | A. T. Hercus | Hayanmi |
| 101 | Captain Black | A | Thoroughbred | J. Flannagan | Omeo |
| 289 | Captain Douglas | A | Draught | W. J. Ellison | Meringur |
| 346 | Carluke | 5 | „ | H. McCluskey | Strathmerton |
| 202 | Carmichael | A | „ | Mrs. M. Newman | Benalla |
| 435 | Cavalier Supreme | 5 | „ | J. C. Wallis | Kaniva |
| 136 | Cavan Boy | 6 | „ | S. Chapman | Katunga |
| 138 | Centredale | A | „ | J. Opie | Werribee |
| 193 | Clair's Pride | A | „ | R. N. Dunn | Rupanyup |
| 263 | Clan Campbell | A | „ | R. J. Fraser | Hopetoun |
| 139 | Clan Newton | A | „ | A. Nicklaus | Peechelba |

STALLION REGISTER 1930-31—*continued.*

| Cert. No. | Name. | Age—Years. | Class. | Owner. | Address. |
|---|---|---|---|---|---|
| 62 | Claymore Junior | A | Pony | J. P. Hanrahan | Ballan |
| 353 | Clifton Star | 4 | Draught | W. Fraser | Watchem |
| 417 | Clyde Bank | A | ,, | J. A. McMillan | Swan Hill |
| 392 | Clydesdale President | A | ,, | L. J. King | Quambatook |
| 412 | Coast Guard | A | ,, | A. G. Turnbull | Winnieburn North |
| 447 | Colonel Garfield | A | ,, | Millard Bros. | Dean's Marsh |
| 16 | Commodore Nut | A | Pony | J. Manifold | Weerite |
| 375 | Cooring Avon | 4 | Draught | R. V. Quick | Brim |
| 264 | Cooring Monarch | 5 | ,, | Mrs. V. Dahlenburg | Winiam |
| 479 | Craigie Lad | 3 | ,, | F. and W. Funcke | Laen P.O. |
| 290 | Craigie Masterstroke | A | ,, | A. Arnold | Werrigar East |
| 53 | Craigieright | A | ,, | W. E. Linke | Jellemjip |
| 341 | Craig's Ideal | 5 | ,, | Mrs. A. Trollop | Cope Cope |
| 179 | Crighton's Tim | A | Pony | S. A. Greaves | Narre Warren |
| 406 | Crofthead Douglas | A | Draught | J. Davies | Curlewis |
| 102 | Crystal Tide | 6 | ,, | A. Dickins | Corowa |
| 64 | Culbo | 6 | Pony | A. W. Thomson | Hamilton |
| 180 | Cymro Harold | 6 | ,, | E. J. Boyle | Kaniva |
| 17 | Dalmore Again | A | Draught | F. Miller | Warrnambool |
| 409 | Dalmore's Choice | A | ,, | A. G. Turnbull | Coleraine |
| 29 | Dalmore Dan | A | ,, | F. J. Matthews | Crowlands |
| 349 | Dalmore's Hero | 3 | ,, | A. Steele | Woomelang |
| 24 | Dalmore's Pride | A | ,, | A. B. Moyle | Yaapeet |
| 119 | Dandy Duke | A | Pony | Kong Meng Bros. | Longwood |
| 402 | Dandy Jim | 5 | ,, | S. Fitzpatrick | Orford |
| 26 | Darling's Comet | A | Draught | Brock Bros. | Moe |
| 118 | Dave Douglas | A | ,, | B. Schultz | Ni Ni Well |
| 302 | Donald's Best | A | ,, | T. C. Robinson | Speewa |
| 335 | Double Court | A | Thoroughbred | Pierce and Wheeler | Towong |
| 69 | Drum Major | 6 | Draught | R. S. Brunt | Kyabram |
| 278 | Drumry Equipment | A | ,, | J. Maher | Tatura |
| 52 | Duddon | A | Thoroughbred | A. P. Wade | Glen Alvie |
| 203 | Duke Little Eyes | A | Draught | A. E. Bowman | Tallangatta |
| 471 | Duke of Hopetoun | 3 | ,, | A. C. Huff | Hopetoun |
| 277 | Dukemore | A | ,, | J. E. Maxwell | Hopetoun |
| 103 | Dunure Blend | A | ,, | Hehr Bros. | Wollert |
| 261 | Eaton Headlight | A | ,, | E. W. Schneider | Yulecart |
| 330 | El Dorado | A | Thoroughbred | F. B. Healey | Kaniva |
| 252 | Emerson | A | Thoroughbred | A. S. Blair | Watchem |
| 120 | Enterprise | A | Draught | J. H. Meyer | Kaniva |
| 97 | Excelsis | 6 | ,, | W. Pizer | Kyneton |
| 70 | Ettrick Dale | A | ,, | J. Fuzzard | Numurkah |
| 9 | Everlasting Dale | A | ,, | A. E. Cox | Alma P.O. |
| 140 | Famous Voyage | A | Light | P. A. Beaumont | Ouyen |
| 141 | Farmer's Pride | A | Draught | H. W. Gepp | Melbourne |
| 28 | Favourite Bold | A | ,, | A. C. Jeffrey | Tallygaroopna West |
| 194 | Favourite Lad | A | ,, | C. E. Gomm | Somerville |
| 4 | Fear Not | A | ,, | G. Peters | Tallandoon |
| 164 | Federation | A | ,, | A. J. Cannon | Irriwillipe East |
| 275 | Fenwick's Pride | 6 | ,, | O. Bassett | Sandmount |
| 104 | Fine View Baron Royal | A | ,, | W. H. Gibbins | Galah |
| 474 | Fine View Elect | 3 | ,, | T. Kelly | Minyip |
| 374 | Fine View Premier | 4 | ,, | K. Cameron | Warracknabeal |
| 363 | Fine View Print | 4 | ,, | H. W. Foran | Vasey |
| 470 | Fine View Squire | 4 | ,, | T. Moroney | Barnedown |
| 512 | First Voyage | A | Light | W. J. Minns | Melton |
| 397 | Flash Bute | 6 | Draught | J. M. Poyner | Lilydale |
| 352 | Flash Voyage | 5 | Light | C. T. Evans | Rathscar |
| 440 | Flashwood | 3 | Draught | J. and W. Thomson | Dimboola |
| 144 | Foreman | A | ,, | W. Wheeler | Whittlesea |
| 164 | Free Scot | A | Light | S. Baulch | Orford |
| 287 | Gallant Kerrston | 4 | Draught | W. J. Beanham | Rutherglen |
| 498 | Gallant Lad | 4 | ,, | W. Starick | Murtoa |
| 495 | Gallant Macarthur | 4 | ,, | T. Nankervis | Diggora South |

STALLION REGISTER 1930-31—*continued.*

| Cert. No. | Name. | Age—Years. | Class. | Owner. | Address. |
|---|---|---|---|---|---|
| 234 | Gay Bold | A | Draught | Amarant Bros. | Wattle Creek |
| 71 | Gay Robin | 6 | ,, | A. Cameron | Orbost |
| 482 | Gay Serenader | A | Thoroughbred | W. Mallinson | Stoneyford |
| 320 | General Favourite | A | Draught | W. Hall | Sunshine |
| 8 | General Garland | A | ,, | H. McKinley | Rochfort |
| 510 | General Harvey | A | ,, | H. E. Byron | Woomelang |
| 452 | General Keith | A | Draught | P. J. McLinden | Salisbury West |
| 105 | Gillies Son | A | ,, | Boyd Bros. | Minhamite |
| 329 | Glencairn Robert | 6 | ,, | W. G. Wilkinson | Yarrawonga |
| 446 | Glenlivet | A | ,, | T. Wakefield | Lockhart |
| 484 | Glenmere Craig | 3 | ,, | J. H. Gove | Warracknabeal |
| 359 | Glenmore's Pride | 3 | ,, | W. E. Maidment | Sandmount |
| 106 | Gobbler | A | ,, | M. J. Cahill | Mannibadar |
| 391 | Gold Brew | A | ,, | W. J. Clarke | Dunkeld |
| 181 | Golden Simmer | A | ,, | M. O'Brien | Hamilton |
| 25 | Graculus | A | Thoroughbred | S. Loveridge | Corowa |
| 502 | Grand Opera | 4 | Light | J. J. Guidice | Kangaroo Flat |
| 445 | Gwalia Caesar | A | Pony | E. McKoy | Wodonga |
| 235 | Gypsy Hero | A | Draught | Mrs. A. G. Andrew | St. James |
| 132 | Hampton Ben | A | ,, | P. Seelander | Warracknabeal |
| 260 | Hard Times | A | ,, | D. Murphy | Rochester |
| 494 | Harry Picture | 3 | Light | Mrs. A. Egan | Rochester |
| 461 | Harry Rose | A | ,, | E. Allan | Ondit |
| 334 | Heather Mac | 5 | Draught | Fuller and Sprigg | Mitre |
| 86 | High Honor | A | ,, | C. H. Feldtmann | Goorambat |
| 269 | Hillhead Knight | A | ,, | H. W. Pannowitz | Diapur |
| 468 | Holton | 4 | ,, | Dyke Bros. | Gre Gre |
| 390 | Homeward Bound | A | Light | D. and J. McCamey | Tinamba |
| 319 | Honest Mac | 3 | Draught | O. R. Poole | Fenton's Creek |
| 395 | Hotspur | A | Pony | J. H. Coad | Yarrowee |
| 433 | Ian Again | 5 | Draught | C. C. Hawker | Lillimur |
| 430 | Ideal Ambassador | 3 | ,, | C. J. Liesfield | Rainbow |
| 491 | Ideal Craigie | 3 | ,, | A. T. Haensler | Jeparit |
| 489 | Ideal Masterpiece | 4 | ,, | T. Parker | Pepper's Plains |
| 493 | Ideal Boy | 3 | ,, | P. C. Cunnington | Bamawm Extension |
| 204 | Interest | A | Pony | A. Kennedy | Arcadia |
| 107 | Jack | A | Draught | W. Fanning | Wyuna East |
| 165 | Jack Craig | A | ,, | W. Sheehan | Muckleford |
| 227 | Jack Marsh | A | Thoroughbred | J. F. McDonald | Bacchus Marsh |
| 338 | Jack Tar | A | Draught | J. C. Dufty | Lorquon West |
| 32 | Jacko | A | ,, | B. F. Schnaars | Netherby |
| 88 | James Osterley | A | Light | Miss M. Huddleston | Geelong |
| 72 | Jimmy Lea | A | ,, | W. Bradshaw, senr. | Skipton |
| 497 | Jock Douglas | 4 | Draught | W. J. Wohlers | Pinnaroo |
| 509 | Jock McGregor | A | ,, | Reseigh and Flockart | Birchip |
| 45 | John Brigham Last | A | Pony | G. N. Buckley | Wickliffe |
| 291 | John Douglas | A | Draught | J. King | Lillimur |
| 472 | John Garthland | 3 | ,, | G. T. Deckert | Kinimakatka |
| 182 | John Shepherd | A | ,, | A. F. Dahlenburg | Salisbury |
| 91 | Justice | A | ,, | A. Stanbury | Piangil |
| 228 | Kelmscott II. | A | ,, | A. R. Yard | Murrayville |
| 223 | Kelso Ideal | A | ,, | D. Greig | Melbourne |
| 317 | Kelso Sensation | 3 | ,, | Starritt Bros. | N.W. Mooroopna |
| 51 | Kelvin | A | ,, | D. McKinnon | Beasley's Bridge |
| 459 | Kenilcost | A | Thoroughbred | W. Barker | Hamilton |
| 205 | Ken's Pride | A | Pony | H. McMeekin | Kyneton |
| 315 | Killawney | A | Draught | E. Neville | Marnoo |
| 121 | King Ballance | A | ,, | F. H. Kennett | Kaniva |
| 50 | King Billy | 6 | ,, | Malook Singh | Manangatang |
| 34 | King Bruce | A | ,, | J. Pearce | Wodonga |
| 92 | King Cal | A | Thoroughbred | D. L. Campbell | Merino |
| 389 | King Clyde | A | Draught | W. Bean | Sale |
| 18 | King Heedless | A | Thoroughbred | J. Manifold | Weerite |
| 206 | King Victor | A | Draught | W. S. Clarke | Docker P.O. |

STALLION REGISTER 1930-31—*continued.*

| Cert. No. | Name. | Age—Years. | Class. | Owner. | Address. |
|---|---|---|---|---|---|
| 274 | King of the Roses II. | A | Draught | M. McGillivray | Bald Rock |
| 166 | King's First | A | ,, | C. A. Jolly | Woomelang |
| 49 | King's Own | A | ,, | C. Carter | Karawinna |
| 332 | King's Star | 3 | ,, | C. A. Wakenshaw | Yarrara |
| 451 | Kitchener's Pride | A | ,, | A. Cheesley | Barnawartha |
| 427 | Korongah Craigwillie | 6 | ,, | J. Davison | Donald P.O. |
| 207 | Lancashire Chief | A | ,, | C. H. Pearson | Horsham |
| 22 | Lancashire Lad | A | ,, | W. Robinson | Armstrong |
| 270 | Langdale | A | ,, | M. Donnellan | Jeffcott North |
| 57 | Lansdale Everest | A | ,, | J. T. Bartlett | Barnawartha |
| 2 | Lavereen Prince Buchlyvie | 5 | ,, | J. Leitch | Wodonga West |
| 469 | Leurgan Rising Sun | 3 | ,, | Dyke Bros. | Gre Gre |
| 213 | Lieutenant | 6 | ,, | McQueen Bros. | Waubra |
| 191 | Little Brigham | A | Pony | J. A. Tuckett | Nerrena |
| 208 | Little Comet | A | ,, | F. Hoysted | Wangaratta |
| 303 | Little Eumarrah | A | ,, | R. Painter | Leaghur |
| 209 | Little Welshman | A | ,, | J. Cameron | Timor West |
| 43 | Lochaber | A | Light | H. Watson | Ross Creek |
| 210 | Lord Aldie | A | Draught | R. T. Redenbach | Tambo Upper |
| 271 | Lord Allen | A | ,, | H. Hibbins | Berriwillock |
| 167 | Lord Armadale | A | ,, | W. G. Hall | Talbot |
| 486 | Lord Baron | 4 | ,, | C. Olson | Jeparit |
| 267 | Lord Bradman | 3 | ,, | H. Redford | Nurcoung |
| 108 | Lord Cedric | A | ,, | F. A. Lehmann | Lismore |
| 211 | Lord Dalmnir | A | ,, | G. E. Mibus | Moutajup |
| 19 | Lord Everest | A | ,, | T. M. Hore | Leitchville |
| 462 | Lord Fabric | A | ,, | E. T. Bail | Torrumbarry |
| 109 | Lord Plunton | A | ,, | A. C. Lowrie | Tyntynder Central |
| 56 | Lord Threave | A | ,, | L. C. Schmidt | Jeparit |
| 319 | Lord Winsome | 5 | ,, | G. E. Roberts | Karawinna |
| 212 | Lowlands Marshall | A | ,, | A. Kennedy | Arcadia |
| 244 | Lucky Boy | A | ,, | Graham Bros. | Bacchus Marsh |
| 168 | Lue Ribbons | A | Light | Williams Bros. | Ross Creek |
| 258 | Lymm Truffle 2nd | A | Draught | J. C. Wallis | Wolseley |
| 145 | Lyndale | A | ,, | W. Rutherford | Nandaly |
| 110 | Lyndhurst | A | ,, | W. L. Roberts | Hopetoun |
| 372 | Lyndhurst Craigie | 3 | ,, | A. Arnold | Warracknabeal |
| 371 | Lyndhurst Master | 3 | ,, | D. W. Tarrant | Warracknabeal |
| 473 | Lyndhurst Radiant | 4 | ,, | W. M. Morris | Minyip |
| 146 | Macedon Hero | A | ,, | B. Evans | Woodfield |
| 284 | Major Dundonald | 3 | ,, | A. McInnes | South Bundalong |
| 73 | Major Lee | A | ,, | E. V. Menzel | Armytage |
| 142 | Major Willie | A | ,, | J. H. Reichelt | Ni Ni Well |
| 195 | Mallee Chavalier | A | ,, | W. A. Hammill | Sale |
| 236 | Marchfield | A | ,, | J. Skelly | Echuca |
| 323 | Marcus | A | Light | Miss B. Reid | Bundoora |
| 111 | Marcus Junior | A | ,, | Blair Bros. | Lara |
| 377 | Mark Hazel | A | Pony | S. W. Ryder | Tawonga |
| 170 | Marquis Dundonald | 6 | Draught | C. H. Fisher | Kenley P.O. |
| 35 | Marvel of Earlshall | A | Pony | R. J. Maclellan | South Yarra |
| 245 | Marvins Heir | A | Light | J. Cantwell | West Melbourne |
| 418 | Master Brook | A | ,, | A. Beattie | Tungamah |
| 59 | May Duke of Penniwells | A | Pony | Mrs. A. D. Maclean | Yan Yean |
| 183 | Meredin | A | Draught | W. G. Roberts | Kerang |
| 189 | Merry Prince | A | ,, | B. Rogers | Mepunga East |
| 214 | Middlerigg Referee | A | ,, | W. McKie | Murtoa |
| 410 | Mikado | A | Thoroughbred | A. G. Turnbull | Winnieburn North |
| 82 | Miniature 3rd | A | Pony | T. Robertson | Macarthur |
| 5 | Moredun Baron | A | Draught | F. Tilley | Port Fairy |
| 368 | Moredun Monarch | 3 | ,, | Exors. of W. Mitchell | Sandford |
| 292 | Morocco Chief | A | ,, | A. Arnold | Werrigar East |
| 400 | Morocco Lad | A | ,, | Mrs. E. Parish | Horsham |
| 36 | Mountain Twig | A | ,, | J. H. Medlyn | St. Arnaud |
| 246 | Napoleon | A | ,, | S. J. Lewis | Baringhup |

STALLION REGISTER 1930–31—*continued.*

| Cert. No. | Name. | Age—Years. | Class. | Owner. | Address. |
|---|---|---|---|---|---|
| 304 | Naseby Flashmore | 3 | Draught | Hewitt and Sons | Werrigar East |
| 237 | Nether Craigends | A | ,, | J. C. Thornton | Waaia |
| 89 | Newfields Pride | A | ,, | R. J. Baldwin | Gre Gre South |
| 75 | Newton Banks | A | ,, | J. R. Morrison | Wooriwyrite |
| 169 | Newton's Pride | A | ,, | G. Crabbe | Colac |
| 238 | Noble Glen | A | ,, | W. Nagorcka | Tarrington |
| 76 | Nonpariel | A | ,, | J. Roberts | Calder's Bag |
| 122 | Novel Song | A | Thoroughbred | Ferguson Bros. | Murmungee |
| 316 | Oaklyn Mac | 4 | Draught | W. Marke | Girgarre East |
| 123 | Onward Baron Belmont | A | ,, | Ferguson Bros. | Murmungee |
| 84 | Opera Boy | 6 | Light | J. Guidice | Kangaroo Flat |
| 293 | Oscar Siam | A | ,, | H. Fehring | Cohuna |
| 221 | Overslade | A | Draught | C. S. Rodda | Warracknabeal |
| 153 | Parsee | 6 | Thoroughbred | W. G. Ritchie | Mansfield |
| 60 | Pat of Transy | A | Pony | Mrs. A. D. McLean | Yan Yean |
| 148 | Patrician Craig | 6 | Draught | A. E. Albert | Willaura |
| 215 | Patriot II. | A | ,, | J. W. Ewing | Penshurst |
| 229 | Patriotic | A | ,, | E. A. Altmann | Rainbow |
| 171 | Periscope | A | Light | J. and M. Ervin | Pyramid |
| 247 | Pettadale | A | Draught | B. McIlraith | Watchem |
| 77 | Playfair | A | ,, | W. Wright | St. Arnaud East |
| 427 | Pocket Edition | A | Pony | J. Clark | Sale |
| 503 | Preble | A | ,, | A. F. McKenzie | Hexham |
| 488 | Pride Darnley | A | Draught | W. C. Dalton | Tempy |
| 93 | Pride of the Lake | A | Thoroughbred | R. F. Blake | Green Lake |
| 448 | Prince Buchlyvie | A | Draught | G. W. Pennel | Elsternwick |
| 478 | Prince Dale | 4 | ,, | J. A. Todd | Beulah |
| 47 | Prince Dale | A | ,, | J. Downey and Son | Wallace |
| 288 | Prince Kerrston | 3 | ,, | R. Carroll | York, W.A. |
| 314 | Prince Que | A | Pony | J. H. Bromley | South Warrandyte |
| 434 | Prince Ribbon | 4 | Light | J. A. Menzel | Hamilton |
| 281 | Prince Wallace | 3 | Draught | Jas. Pole | Nullawil |
| 31 | Quattas Belmont | A | ,, | M. Lindsay | Baranduda |
| 61 | Raseel | 6 | Arab | Mrs. A. D. Maclean | Yan Yean |
| 511 | Red Direct | 3 | Light | P. G. Weaver | Boort |
| 14 | Regis | A | Draught | E. Manifold | Camperdown |
| 405 | Resolution | A | ,, | Miller Bros. | Bacchus Marsh |
| 37 | Review | A | ,, | J. W. Donnan | Watchupga |
| 78 | Rising Morn | A | ,, | C. C. Hawker | Lillimur |
| 38 | Rising Sun | A | ,, | J. O'Bree | Piangil |
| 23 | Rizzio | A | ,, | J. W. Dove | Moonee Ponds |
| 251 | Robert Bruce | A | ,, | H. Gregerson | Benalla |
| 63 | Rocket | A | Pony | A. W. Thomson | Hamilton |
| 477 | Roseleaf | 5 | Draught | A. Bannerman | Brim |
| 285 | Rosencraigie | 3 | ,, | W. G. Wilkinson | Yarrawonga |
| 429 | Rose Vale | 3 | ,, | L. H. Roll | Hopetoun |
| 460 | Roseworthy | A | ,, | E. Allen | Ondit |
| 475 | Roy Dale | 5 | ,, | J. A. Todd | Beulah |
| 39 | Royal Bellman | 6 | ,, | A. A. Johns | Horsham |
| 480 | Royal Belmont | 5 | ,, | W. A. Creighton | Alexandra |
| 308 | Royal Brigham | A | Pony | Hinkley and Sons | Beeac |
| 419 | Royal Bute | A | Draught | G. Luckie | Springhurst |
| 13 | Royal Dale | 6 | ,, | C. Fuller | Linga |
| 399 | Royal Dale | 6 | ,, | M. Kennedy | Winslow |
| 408 | Royal Douglas | A | ,, | J. Dugdale | Myrniong |
| 183 | Royal Duke | A | ,, | M. J. O'Brien | Hamilton |
| 149 | Royal Fashion | A | ,, | F. Shaw | St. Arnaud |
| 328 | Royal Gartley II. | A | ,, | S. Sleep | Warracknabeal |
| 155 | Royal Hiawatha | 5 | ,, | Jolliffe Bros. | Newlyn |
| 79 | Royal Kerrston | 6 | ,, | F. Hamilton | Coonooer Bridge |
| 463 | Royal King | 5 | ,, | C. E. Pencker | Nandaly |
| 248 | Royal Northcote | 6 | ,, | A. Cunningham | Nhill |
| 112 | Royal Peter | A | ,, | R. E. Hanson | Fern Hill |
| 425 | Royal Prince | 4 | ,, | T. F. Hetherton | Piangil |

STALLION REGISTER 1930–31—*continued.*

| Cert. No. | Name. | Age—Years. | Class. | Owner. | Address. |
|---|---|---|---|---|---|
| 124 | Royal Scotch | A | Draught | R. H. Smith | Willenabrina |
| 257 | Royal Sunbeam | A | ,, | N. Ramsay | Newbridge |
| 172 | Royal Top | 6 | Pony | C. McKebery | Coleraine |
| 420 | Royal View | A | Draught | S. Landers | Salisbury |
| 387 | Royalty | A | Pony | W. Coe | Coleraine |
| 150 | Rufus | A | Draught | Mrs. S. E. Kent | Sheep Hills |
| 48 | Sandys Fashion | A | ,, | F. T. Hemley | Glenorchy |
| 96 | Santa Claus | A | Pony | W. C. Greaves | Monomeith |
| 117 | School Bells | A | ,, | F. Bolton | Warracknabeal |
| 196 | Scotch Crown | 6 | Draught | S. Howard | Boundary Bend |
| 239 | Scotch Laddie | A | ,, | E. Smith | Warragul P.O. |
| 449 | Scotchie | A | ,, | I. Kelly | Korong Vale |
| 456 | Scotland's Dignity | A | ,, | J. H. Meyer | Kaniva |
| 376 | Scotland's Victor | 6 | ,, | Clyne Bros. | Tinambra |
| 40 | Scotland's Victory | A | ,, | A. Pencker | Sea Lake |
| 455 | Scottish Banker | A | ,, | G. L. Byrne | Kewell North |
| 230 | Scottish Chief | A | ,, | J. Bourke | Edi |
| 506 | Scottish Laird | A | ,, | R. B. Rogers | Natimuk |
| 439 | Scottish Premier | 3 | ,, | C. C. Jorgenson | Katyil |
| 255 | Scottish Prince | A | ,, | R. K. Johns | Angip |
| 41 | Scotty | A | ,, | J. Roulston | Muskerry East |
| 216 | Shepherd Again | A | ,, | W. McKie | Murtoa |
| 125 | Shepherd King | A | ,, | T. Gilchrist | Rutherglen |
| 217 | Shepherd's Boy | A | ,, | A. Broom | Neereman |
| 386 | Sir Armadale | A | ,, | J. Lincoln | Portarlington |
| 385 | Sir Douglas Haig | A | ,, | J. Lincoln | Portarlington |
| 465 | Sir Everest | A | ,, | A. Ralston | Lucknow |
| 12 | Sir George | A | Pony | J. K. Russell | Hesse |
| 186 | Sir George Robin | A | Draught | K. Cameron | Warracknabeal |
| 487 | Sir Royal Charm | 5 | ,, | W. B. Monaghan | Speed |
| 250 | Sir Rupert | A | ,, | Geo. Kelly | Rochester |
| 407 | Sir Walter Burnside | A | ,, | F. Schroeder | Carinya P.O. |
| 11 | Slip Knot | A | ,, | J. K. Russell | Hesse |
| 218 | Sportsman's Hero | A | ,, | A. Kennedy | Arcadia |
| 504 | Springbank Laurence | A | ,, | W. H. Crawford | Hamilton |
| 273 | St. Aidan | A | Light | M. Cribbes | Faraday |
| 356 | Strathhellar Radiance | 4 | Draught | L. Price | Condah Swamp |
| 173 | Stryver | A | ,, | J. Elliott | Gillieston |
| 174 | Style O | A | Light | W. Barry | Heathcote |
| 175 | Sudbourns Chief | A | Draught | G. H. Stray | Tabilk |
| 3 | Sudbourns Victory | A | ,, | V. A. Hicks | South Melbourne |
| 279 | Sum Time | A | ,, | R. Nicholson | Pirlta |
| 476 | Surrydale | 4 | ,, | J. A. Hinton | Vite Vite North |
| 42 | Tam O'Shanter Bill | A | Pony | G. Gordon | Ellerslie |
| 331 | The Cavalier | A | Draught | L. G. Koch | Pine Lodge |
| 369 | The Count | 5 | Pony | A. M. Thomson | Hamilton |
| 231 | The Crown | A | Draught | W. B. McIntosh | Ellam |
| 326 | The Dux | A | ,, | J. Hargreaves | Dederang |
| 428 | The Night Patrol | 5 | Light | W. E. Holmes | Rainbow |
| 394 | The Toff | A | Pony | R. M. Kenyon | Sale |
| 305 | Thoughtful | A | ,, | J. A. E. Rippon | Cororooke |
| 454 | Tim Anton | A | Thoroughbred | F. C. Coy, jun. | Bookar |
| 273 | Timely Direct | A | Light | J. M. Cromie | Bangholme |
| 500 | Tiny Tim | 3 | Pony | R. Winterbottom | Mincha |
| 421 | Titanic | A | ,, | A. Young | Mooroopna |
| 66 | Toby | A | ,, | A. W. Thomson | Hamilton |
| 113 | Tommy Dodd | A | ,, | Boyd Bros. | Minhamite |
| 458 | Top Score | A | Draught | E. J. Ficken | Moonee Ponds |
| 492 | Tremenhere Auchenflower | 3 | ,, | C. N. Davies | Rochester |
| 126 | Tressayr | A | Thoroughbred | F. Widdicombe | Gymbowen |
| 359 | Trevallyn Baron Dale | 5 | Draught | F. R. Widdicombe | Digby |
| 1 | Trimmer | 6 | ,, | W. J. Newton | Bridgewater |
| 280 | Udalo | A | ,, | J. Holdsworth | Jung Jung |
| 431 | Valetta Archies Honour | 4 | ,, | Hicks Bros. | Miram |

STALLION REGISTER 1930-31—*continued.*

| Cert. No. | Name. | Age—Years. | Class. | Owner. | Address. |
|---|---|---|---|---|---|
| 357 | Valetta Baron Mac | 4 | Draught | Geo. Gray | Branxholme |
| 7 | Valiant | A | Thoroughbred | S. E. Bailey | Pura Pura |
| 423 | Vanquisher | 4 | Draught | J. O'Bree | Swan Hill |
| 6 | Viceroy Favourite | 6 | ,, | Harris Bros. | Garvoc |
| 515 | Victoria Flash Brilliant | 4 | Draught | Manager, Research Farm | Werribee |
| 508 | Vue Dale | A | ,, | N. W. Quick | Mollonghip |
| 114 | Vulcan | A | Pony | Boyd Bros. | Minhamite |
| 94 | Waikoura | A | Draught | G. W. Francis | Lower Norton |
| 306 | Waironga Clyde | A | ,, | R. S. Fraser | Jil Jil |
| 187 | Waituna | A | ,, | S. A. Greaves | Narre Warren |
| 464 | Wakapero | A | ,, | G. R. Ladson | Mincha West |
| 373 | Walden's Radiant | 5 | ,, | H. J. Bunge | Sheep Hills |
| 115 | Wallace Dale | A | ,, | W. J. Dixon | Donald |
| 495 | Wandella Dignity | 3 | ,, | J. A. Bodey | Bostock's Creek |
| 259 | War Lord | A | ,, | T. Attenborough | Poowong North |
| 95 | Welsh Flyer | A | Light | P. J. Reid | Milawa |
| 499 | Werndew Golden Footprint | 4 | Draught | C. H. Perkins | Rainbow |
| 505 | Weston Hero | A | ,, | A. G. Gordon | Broughton |
| 361 | White Prophet | A | Thoroughbred | R. Stoddart | Warragul |
| 30 | Widgiewa Alick | A | Draught | Jackson Bros. | Piree |
| 41 | Widgiewa Cavalier | A | ,, | H. S. Maddern | Serviceton |
| 254 | Widgiewa Belmont | A | ,, | J. A. Roberts | Willenabrina |
| 312 | Widgiewa Digger | 6 | ,, | J. W. Menzel | Cowangie |
| 44 | Widgiewa Edward | A | ,, | W. G. Down | Koonda |
| 176 | Widgiewa Glancer | A | ,, | A. Creighton | Tungamah |
| 438 | Widgiewa Intent | 5 | ,, | F. A. McRae | Wallup |
| 321 | Widgiewa Ivan | 5 | ,, | J. K. McKenzie | Pinnaroo |
| 442 | Widgiewa Ivo | A | ,, | E. McKoy | Wodonga |
| 188 | Widgiewa Lebbeus | A | ,, | A. Muir | Picola North |
| 151 | Widgiewa Mark | A | ,, | G. R. Ladson | Mincha West |
| 143 | Widgiewa Marshall | A | ,, | J. Henderson | Baulkamaugh North |
| 313 | Widgiewa Ninian | A | ,, | W. Robertson | Annuello |
| 324 | Widgiewa Norseman | A | ,, | Wilkinson and Young | Yarrawonga |
| 467 | Widgiewa Norval | 6 | ,, | Manager, Research Farm | Werribee |
| 189 | Widgiewa Stephen | A | ,, | Hewitt and Sons | Werrigar East |
| 384 | Wigton's Pride | A | ,, | L. J. King | Quambatook |
| 219 | William Wallace | A | ,, | E. Bish | Wycheproof |
| 152 | Willie Belmont | 6 | ,, | J. S. P. Allen | Broughton |
| 365 | Willie McBride | A | ,, | A. Holmberg | Hunter South |
| 426 | Willie Northcote | 4 | ,, | W. G. Ross | Miram |
| 298 | Willies Knight | 5 | ,, | H. Redford | Gymbowen |
| 437 | Wimmera Success | 3 | ,, | A. H. Pietsch | Dimboola |
| 325 | Winning Hit | A | ,, | J. Hargreaves | Eskdale |
| 348 | Winsome Banker | 3 | ,, | W. T. Arthur | Lascelles |
| 295 | Winsome Chief | A | ,, | C. R. Peterson | Kellalac |
| 232 | Young Badawen | A | Pony | A. Baensch | St. Arnaud |
| 422 | Young Clyde | 5 | Draught | S. J. Taylor | Lake Boga |
| 80 | Young Clydeside | A | ,, | H. Jager | Swan Hill |
| 220 | Young Coronation | A | ,, | W. J. Bennett | Cannie R.S. |
| 127 | Young Dan | A | ,, | J. V. Haggbloom | Sea Lake |
| 83 | Young Ki Ki | A | Pony | T. Robertson | Macarthur |
| 249 | Young Lymney Champion | A | Draught | W. H. Penaluna | Boolarra |
| 128 | Young Middlemarch | A | ,, | W. D. H. Smith | Dimboola |
| 116 | Young Sapper | A | ,, | H. White | Cowangie |
| 307 | Young Simon | A | ,, | J. G. Girvan | Junortoun |
| 336 | Young Starling | A | Light | W. Regan | Moonee Ponds |
| 507 | Zone Time | A | Draught | J. Gibson | Benambra |

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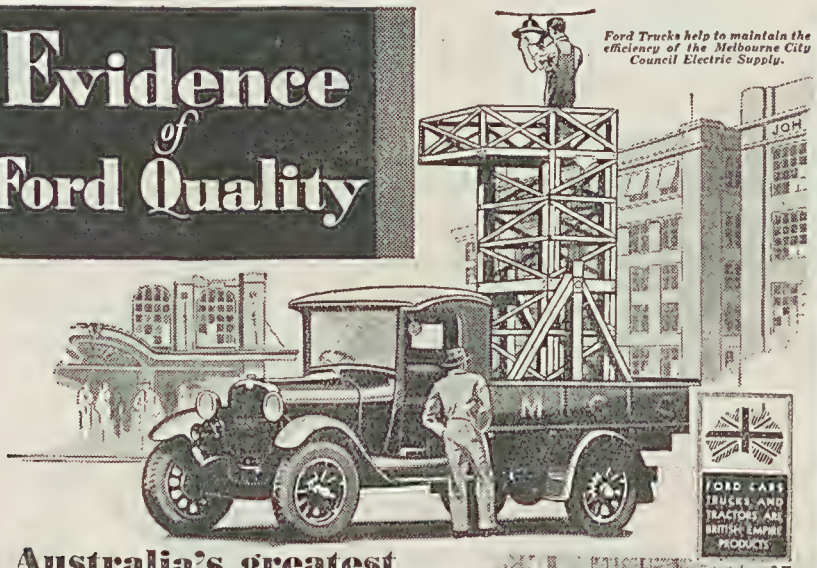


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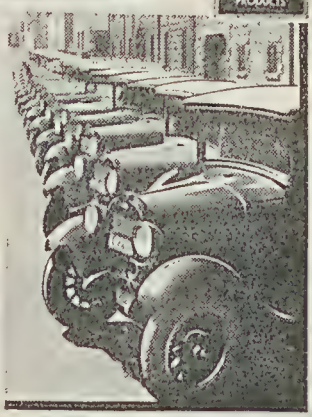

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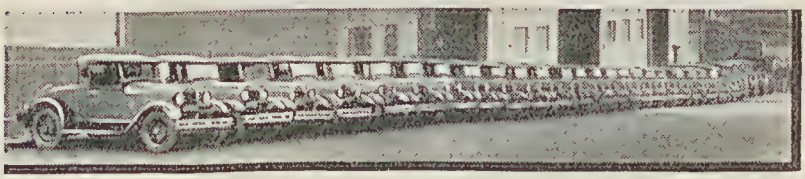
*Units of Melbourne City Council Electricity Supply fleet of Ford Vehicles*



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**5 BULL CALVES** **FOR SALE** **5 BULL CALVES**

All are progeny of tuberculin-tested stock, and of cows tested in the Standard Herd Test. All are eligible for Registration in the Red Poll Herd Book of Australasia.

**1.** *Born* .. 26th October, 1930
*Sire* .. Victoria Major Royal (817 AA)
*Dam* Victoria Avesta (1142 AA)
**21 Guineas**

**2.** *Born* .. 24th March, 1931
*Sire* .. Victoria Major Royal
*Dam* .. Victoria Village Belle (1522 AA)
**20 Guineas**

**3.** *Born* .. 24th December, 1930
*Sire* Dominion Bright Belgian (A.299 N.Z.R.P.H.B.)
*Dam* Victoria Guilder (2430 B)
**20 Guineas**

**4.** *Born* .. 30th December, 1930
*Sire* .. Earl of Beaconsfield (35 AA)
*Dam* Victoria Velbit (2341 A)
**17 Guineas**

**5.** *Born* .. 11th February, 1931
*Sire* Dominion Bright Belgian
*Dam* .. Victoria Euphrates (716 A)
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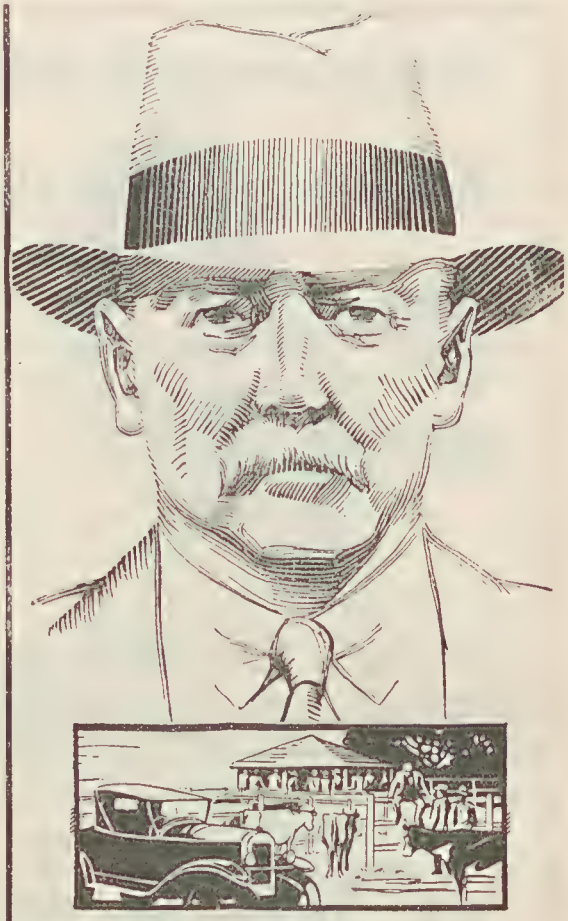

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**1.** *Born* ... ... 26th October, 1930
*Sire* ... Victoria Major Royal (817 AA)
*Dam* ... Victoria Avesta (1142 AA)

**21 Guineas**

**2.** *Born* ... ... 24th March, 1931
*Sire* ... ... Victoria Major Royal
*Dam* ... Victoria Village Belle (1522 AA)

**20 Guineas**

### 5 BULL CALVES

**3.** *Born* ... ... 24th December, 1930
*Sire* ... ... Dominion Bright Belgian A.299 N.Z. R.P.H.B.
*Dam* ... ... Victoria Guilder (2430 B)

**20 Guineas**

**4.** *Born* ... ... 30th December, 1930
*Sire* ... Earl of Beaconsfield (35 AA)
*Dam* ... ... Victoria Velbit (2341 A)

**17 Guineas**

**5.** *Born* .. ... 11th February, 1931
*Sire* .. ... Dominion Bright Belgian
*Dam* ... Victoria Euphrates (716 A)

**24 Guineas**

*The prices quoted are based on the butterfat production of the dam at the rate of 1/- per lb., except in the case of progeny of heifers without completed test, the price then being 10 guineas.*

Inspection cordially invited. For further particulars apply to—

DR. S. S. CAMERON, DIRECTOR OF AGRICULTURE, MELBOURNE, C. 2;
OR THE MANAGER, STATE RESEARCH FARM, WERRIBEE.

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